



Functional Urology

Segmental infarction of the kidney upper pole as cause of acute back pain

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ARTICLE INFO

Keywords:

Acute renal ischemia
 Anterosuperior segmental artery
 Renal infarction

ABSTRACT

Renal infarction is a rare condition often misdiagnosed as more common renal disorders due to similar symptoms. This case report highlights a 52-year-old patient who presented with severe lumbago and was diagnosed with segmental renal infarction in the upper pole of the left kidney. The patient's clinical course, diagnostic evaluation, and multidisciplinary management are described. The importance of early diagnosis through imaging techniques, such as computed tomography, is emphasized. Treatment strategies, including anticoagulation and pain management, are discussed. This case underscores the need for a high index of suspicion to ensure timely diagnosis and appropriate management of renal infarction.

1. Introduction

Renal infarction (RI) is a rare condition, and its symptoms often resemble more common renal disorders, such as kidney stones, leading to confusion in its early diagnosis. The primary clinical manifestation of both conditions is lower back pain or colicky renal pain. When this pain occurs suddenly, it is typically initially attributed to other causes.¹ As a symptom so common, its diagnosis and management can be challenging for clinical specialists, especially in today's world where the patient's lifestyle directly and indirectly influences the development of this condition. The incidence of renal infarction is usually estimated to be between 0.007 % and 1.4 % worldwide and previous investigations have indicated that the incidence rate of RI in the emergency department is within the range of 0.004 % to 0.007 %, although it is believed that the actual incidence is likely higher than what has been detected.^{2,3} Furthermore, it has been reported that a substantial proportion, ranging from 65 % to 85 % of individuals with RI present with complaints of flank pain³.

Evidence regarding the effectiveness of treatment for this group of patients has been limited due to errors made during the diagnostic process of this condition and the lack of high-level clinical trials, such as randomized controlled trials.² Renal infarction, whether caused by ischemia of its main artery or any of its branches, is primarily associated with a thromboembolic state, more common in patients with a history of high blood pressure or renal insufficiency.⁴

The management of renal infarction encompasses a multifaceted approach aimed at addressing the underlying cause, alleviating

symptoms, and preventing complications. Typically, anticoagulation therapy, employing medications such as heparin or low molecular weight heparin, is initiated to hinder further thrombus formation and enhance blood flow. Thrombolytic therapy may be considered in select cases with substantial thrombus burden and early presentation.^{5,6} Pain management, utilizing analgesics like nonsteroidal anti-inflammatory drugs or opioids, is crucial for mitigating severe flank pain associated with renal infarction. Addressing the underlying cause, whether it be a cardiac embolus or another vascular lesion, is fundamental for long-term management. Revascularization procedures, such as angioplasty and stent placement, may be considered in specific cases to restore blood flow. Regular follow-up imaging and monitoring of renal function through blood tests further guide the assessment of treatment efficacy and ongoing issues.⁷

2. Case presentation

This concerns a 52-year-old patient with a known medical history of long-standing hypertension, who was admitted due to a one-week history of severe lumbago, rated 10/10 on the pain scale. Unable to tolerate the pain during the early morning hours, without prior medication, the patient decided to seek emergency care. The following day, the patient visited the Urology clinic, where, upon evaluation, a CT scan was requested, which reported "segmental renal infarction in the upper pole of the left kidney." Consequently, upon such findings, it was decided to admit the patient and request a multidisciplinary consultation with the Hematology department. The patient had a history of polycythemia

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<https://doi.org/10.1016/j.eucr.2023.102635>

Received 14 November 2023; Received in revised form 26 November 2023; Accepted 1 December 2023

Available online 11 December 2023

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associated with symptoms such as asthenia, adynamia, dyspnea, blurred vision, and chest pain, which improved after phlebotomy. The patient's last phlebotomy was performed two years ago. The patient denies drug use, medication, object or food allergies, previous transfusions, smoking, or prior surgeries, but consumes alcohol and coffee occasionally.

On physical examination, the patient was conscious, alert, and febrile with a temperature of 37.6 °C, blood pressure of 130/80 mmHg, and a heart rate of 84 bpm. The abdomen was globular, depressible, non-tender to superficial or deep palpation, with no masses or visceromegaly, and positive left costovertebral angle percussion.

The initial blood tests revealed a hematocrit of 50 %, Hb 17.1g/dL, fibrinogen 533mg/dL, and an increased erythrocyte sedimentation rate (ESR) of 36mm/hr, indicating a hypercoagulable state. As a result, the Hematology department initiated treatment with low molecular weight heparin and management of erythrocytosis and orders a Doppler ultrasound of the lower limb veins and chest CT angiography to rule out other symptoms of thrombosis, with negative results.

After performing a computed tomography (CT) scan of the abdomen (Fig. 1), a "stop" image was observed in the coronary section, leading to a diagnosis of segmental renal infarction in the upper pole of the left kidney and constipation. The right kidney showed no abnormalities. Subsequently, contrast-enhanced abdominal CT angiography (Fig. 2) was performed, revealing an acute ischemic vascular lesion in the superior segmental artery of the left kidney, causing ischemia in the ipsilateral upper pole. Additionally, a chest CT angiography was performed to exclude the presence of thrombophilia, which showed no arterial occlusion, arteriovenous malformations, or sacular dilations. Arterial and venous Doppler ultrasound of the lower limbs was also conducted to rule out stenosis or deep vein thrombosis.

Considering the patient's history of hypertension, erythrocytosis, and elevated hematocrit levels, full-dose anticoagulation with low



Fig. 1. Contrast-enhanced abdominal CT scan - absence of contrast uptake by the left kidney.

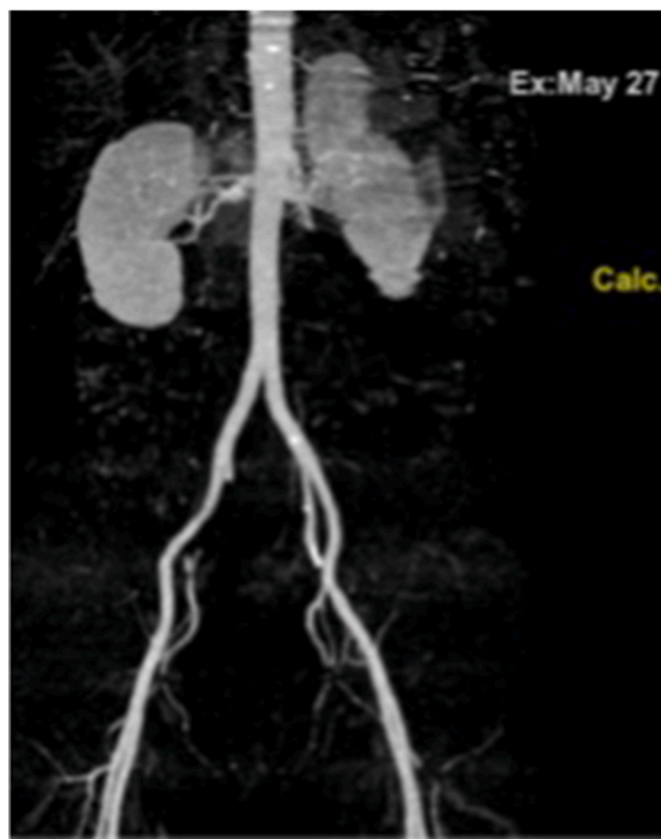


Fig. 2A. Imaging study: Contrast-enhanced abdominal CT angiography - absence of contrast uptake in the anterosuperior pole of the left kidney.

molecular weight heparin at 7500 IU every 24 hours was initiated. Pain management included clonixinate lysine 125mg and propinoxate hydrochloride 10mg (1 ampoule every 8 hours), along with lactulose 10ml orally for bowel movement, 0.9 % saline solution at 1000ml, and intravenous paracetamol 1g.

Daily hemogram control was performed at 6 a.m. until the patient was discharged on the third day after admission, with improvement in clinical symptoms of pain, constipation, and fever. The patient was stable and showed improvement, leading to a decision by the Urology department to discharge the patient with instructions for antiplatelet medication and follow-up appointments in one week with the Hematology and Urology departments.

3. Discussion

Acute renal ischemia is a rare condition associated with a high morbidity and mortality, with more than half of the cases not being linked to heart disease. Due to incorrect or delayed diagnosis, it often leads to the progression of kidney disease. Renal embolism is typically the most common cause of acute renal ischemia. The location of the ischemia is a crucial factor as its severity depends on it.⁸ Renal infarction, characterized by the disruption of blood supply to a segment of the kidney, results in ischemia and potential tissue damage if severe. The pathophysiology of this condition involves a cascade of events initiated when blood flow to the kidney is compromised. Thrombosis or embolism, commonly arising from factors such as atrial fibrillation or valvular disease, often precipitates renal infarction.⁹ Once a blood clot or embolus lodges in a renal artery, it induces ischemia, diminishing oxygen and nutrient supply to the affected area. This deprivation triggers cellular injury and dysfunction, with renal cells particularly susceptible to ischemic damage.¹⁰ The ensuing inflammatory response exacerbates tissue damage, while the activation of the renin-angiotensin-aldosterone



Fig. 2B. Imaging study: Contrast-enhanced abdominal CT angiography - absence of contrast uptake in the anterosuperior pole of the left kidney.

system, prompted by reduced renal blood flow, seeks to restore perfusion but may contribute to hypertension and further harm if unregulated. Prolonged ischemia leads to cellular necrosis, potentially resulting in irreversible damage and scar tissue formation.¹¹

Contrast-enhanced abdominal computed tomography is the preferred tool for establishing the correct and early diagnosis of this condition.^{1,4} Thanks to the symptoms presented by the patient, an abdominal ultrasound was initially performed to rule out any obstructive renal pathology. However, as the pain persisted and no significant findings were observed, a contrast-enhanced abdominal CT scan was conducted, revealing signs of ischemia in the anterosuperior segmental renal artery. The definitive diagnosis was established through abdominal angiotomography, which showed a lack of contrast uptake in the anterosuperior pole of the left kidney. Renal ultrasound has a very low sensitivity for diagnosing renal infarction, with only 11 %, and is therefore not recommended for clinical practice.¹²

After obtaining the diagnosis of renal infarction, possible causes that led to this event are ruled out. Electrocardiogram, chest angiography, venous and arterial Doppler of the lower extremities, and a thrombophilia panel are performed to exclude arterial stenosis or deep venous thrombosis. There are no established guidelines for the treatment of this condition. Therefore, treatment typically depends on the apparent cause, the presented symptoms, and the diagnostic imaging. Anticoagulants are often administered as a first-line treatment, with the prognosis for the patient being more favorable the earlier treatment is initiated, aiming to reperfuse the renal parenchyma.² Nevertheless, it's important to consider that conservative treatment is often preferred over surgical treatment, reserving surgery for patients with a single kidney or bilateral renal thrombosis.^{1,4}

In the case of our patient, the affected artery was the anterosuperior segmental artery, causing ischemia in only the renal segment supplied

by that artery. Since there is no established protocol or algorithm to follow in such cases, outpatient anticoagulation is prescribed, and strict multidisciplinary monitoring is maintained.

4. Conclusion

In conclusion, renal infarction is a rare condition that often presents with nonspecific symptoms, leading to diagnostic challenges. Timely recognition and appropriate imaging studies are crucial for accurate diagnosis. Computed tomography with intravenous contrast is the preferred method for early detection. Renal ultrasound has limited sensitivity and is not recommended for diagnosis. After confirming the diagnosis, it is important to investigate the underlying causes and rule out thrombosis or stenosis. Treatment should be tailored to the individual patient, with anticoagulants as the first-line therapy. Early initiation of treatment improves prognosis. Conservative management is usually preferred over surgical intervention, except in specific cases. Patients with occlusion of a segmental artery may have a more favorable outcome. Further research and standardized guidelines are needed to improve the management and outcomes of acute renal ischemia.

Consent

Informed consent was taken from the patient for publication of this case report and the associated images.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

The work described has not been published previously. This data has been presented in a.

CRedit authorship contribution statement

José Julio Sicard: Conceptualization, Methodology, Supervision. **Victor De Jesus Liz:** Investigation, Resources. **Maria Gomez:** Visualization, Writing – review & editing. **Rosseisela Castillo:** Project administration, Writing – original draft.

Declaration of competing interest

None.

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