

Acute Renal Infarction Patients in the Emergency Department Acil Servisteki Akut Böbrek Enfarktöslü Hastalar

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Summary

Aim: Renal infarction is a rare condition and due to its nonspecific presenting complaints, the diagnosis of renal infarction is often missed or delayed. Aim of the study was to investigate the clinical characteristics of patients who present to the emergency department (ED) with renal infarction.

Material and Method: This retrospective study was conducted between 2012 and 2017 in an urban tertiary care ED. The institutional electronic medical record system and patient files were reviewed retrospectively for patients who were diagnosed with renal infarction in the ED. The demographic data, presenting complaints, thromboembolic risk factors, the diagnostic investigations used and treatments applied were reviewed.

Results: The number of patients diagnosed with renal infarction within the study period was 20 (0.002%). All patients had unilateral renal infarction and in 15 (75%) patients the right kidney was involved. The median age was 60 years and 10 (50%) of the patients were male. Fourteen patients (70%) had an increased risk of thromboembolic events. Lactate dehydrogenase (LDH) levels were studied in 10 patients, and all 10 of the patients had high LDH levels. About one-third of the patients had hematuria in the urine analysis, half of the patients had elevated liver function tests (AST, ALT), and 70% had high urea and creatinine levels. All patients were treated conservatively without any surgical intervention and none of the patients died.

Conclusion: Renal infarction should be considered in patients with an increased risk of thromboembolism who present to the ED with flank pain.

Key words: Emergency department,, flank pain, renal infarction, thromboembolism

Özet

Amaç: Böbrek enfarktüsü nadir bir durumdur ve spesifik olmayan başvuru şikayetleri nedeniyle böbrek enfarktüsü tanısı genellikle gözden kaçır veya gecikir. Bu çalışmanın amacı acil servisteki renal enfarkt olgularının klinik özelliklerini araştırmaktır.

Gereç ve Yöntem: Bu retrospektif çalışma, 2012 ve 2017 yılları arasında üçüncü basamak bir hastanenin acil servisinde yapıldı. Acil serviste renal enfarkt tanısı alan hastalara ait veriler hastane otomasyon sisteminden ve hasta dosyalarından geriye dönük olarak araştırıldı. Hastalara ait demografik veriler, başvuru şikayetleri, tromboembolik risk faktörleri, tetkikler ve tedavileri incelendi.

Bulgular: Çalışma sürecinde renal enfarkt tanısı alan hasta sayısı 20 idi (%0.002). Hastaların tümünde tek taraflı renal enfarkt saptandı ve 15 (%75) hastada sağ böbrek tutulumu vardı. Hastaların median yaşı 60 yıl idi ve %50'si (n:10) erkekti. Hastaların 14'ü (%70) tromboembolik olay açısından artmış riske sahipti. Hastaların 10 tanesinde laktik dehidrogenaz çalışılmıştı ve tamamında yüksekti. İdrar analizi yapılan hastaların yaklaşık üçte birinde hematüri olduğu, yarısında karaciğer fonksiyon testlerinin (AST, ALT) yüksek olduğu ve %70'inde ise böbrek fonksiyon testlerinin (üre, kreatinin) yüksek olduğu saptandı. Tüm hastalar cerrahi müdahale yapılmaksızın konservatif olarak tedavi edildi ve hiçbir hasta ölmedi.

Sonuç: Acil servise yan ağrısı ile başvuran emboli açısından yüksek riskli hastalarda renal enfarkt mutlaka akla getirilmelidir.

Anahtar Kelimeler: Acil servis, yan ağrısı, renal enfarkt, tromboembolizm

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Introduction

Renal infarction is a rare condition with an

estimated incidence of 0.004%, and our current knowledge of the disease is limited (1-4). Due to its rarity and nonspecific presenting complaints,

the diagnosis of renal infarction is often missed or delayed (5).

The nonspecific presenting complaints of patients with renal infarction may easily be mistaken for other clinical conditions such as nephrolithiasis, pyelonephritis and acute abdominal emergencies (5,6). A delay in the diagnosis and treatment of renal infarction may lead to complications such as other thromboembolic events and renal failure (4,7). Renal infarction is caused by the partial or complete occlusion of the renal artery (6). The most common cause of renal infarction is an embolism in the main renal artery or its branches (1,8).

In order to prevent organ loss and preserve renal functions, the diagnosis of renal infarction should be made without delay. A high level of suspicion is essential for early diagnosis. For this reason, emergency medicine physicians need clinical clues leading to the correct diagnosis. In this study, the data on patients with renal infarction were evaluated in order to determine the parameters for predicting this rare disease.

Material and Methods

This retrospective study was conducted between January 2012 and June 2017 in an urban tertiary care ED which receives approximately 180,000 visits annually. The study was approved by the

local ethics committee. The electronic medical record system and patient files were retrospectively reviewed for patients aged 18 years and older who were diagnosed with renal infarction in the ED. The demographic data (age, gender), clinical features (presenting complaints; time between presentation and contrast-enhanced computerized tomography (CT) scanning, concomitant diseases, laboratory findings (renal and liver function tests, serum electrolytes, white blood cell (WBC) count, and urine analysis), and final outcomes were reviewed by two emergency medicine physicians.

Contrast-enhanced CT imaging was used to confirm the diagnosis of renal infarction (Figure 1). All contrast-enhanced CT images were obtained using a "Siemens Emotion Duo 2 section/sec" device with a 10-mm section thickness. Findings suggestive of renal infarction on contrast-enhanced CT were as follows: wedge-shaped parenchymal perfusion defect, cortical rim sign (a rim of capsular enhancement surrounding the hypodense area), perirenal stranding with thickening of the Gerota's fascia, and the absence of urinary excretion of contrast material (3,7,9,10). All CTs were reviewed by two experienced emergency medicine physicians using the Picture Archiving Communication System (PACS).

Figure 1. Contrast-enhanced computed tomography scan of a patient with renal infarct. Arrow indicate a wedge-shaped parenchymal perfusion defect in the left kidney



The WBC count and serum biochemical tests were performed within the first hour of admission. Impaired renal function was defined as a serum creatinine level >1,1 mg/dL and an urea level >43 mg/dL. The WBC count was determined using the Coulter LH 780 Hematology Analyzer (Beckman Coulter Inc., Miami, FL, USA). Biochemical parameters were analyzed using the Olympus AU 640 fully automated analyzer (Beckman Coulter Inc., Miami, FL, USA).

All statistical analyses were performed using the SPSS statistical software (SPSS for Windows, version 22.0; SPSS, Inc., Chicago, IL, USA). Qualitative variables were represented by percentage and number of observation. Quantitative data were expressed as medians, interquartile range (IQR), minimum (min), and maximum (max) values. Mann-Whitney U test and Spearman correlation analysis were used to analyze quantitative data. All analyses were performed at a 95% confidence interval. A p-

value <0.05 was considered to be statistically significant.

Results

During the 65 month study period, the number of patients who presented to the ED was 958207 and 20 (0.002%) of these patients were diagnosed with renal infarction. All patients had unilateral renal infarction and in 15 (75%) cases, the right kidney was involved. The median age was 60 years (IQR:26 ; min:18 ; max:88 years) and 50% of the patients (n:10) were male. The median time between presentation and diagnosis by contrast-enhanced CT was 250 min (IQR:188 ; min:67 ; max:608 minutes). The median systolic and diastolic blood pressures of patients were 130 mmHg (IQR:33 ; min:110 ; max:211) and 70 mmHg (IQR:23 ; min:55 ; max:116), respectively. The demographic data and laboratory parameters of patients with renal infarction are presented in Tables 1 and 2.

Table 1. The demographic data of patients

Data	n (%)
Male	10 (50)
Age (median; years)	60
Involved kidney	
Right	15 (75)
Concomitant splenic infarction	2 (10)
Presenting complaint	
Abdominal pain	7 (35)
Flank pain	12 (60)
Nausea and vomiting	4 (20)

Table 2. The laboratory parameters of patients

Blood tests	Median (IQR)	Reference range
White blood cell (K/ μ L)	11.4 (5.5)	4.2-10.6
Urea (mg/dL)	33.5 (18)	17-43
Creatinine (mg/dL)	1.1 (0.3)	0.6-1.1
Aspartate aminotransferase (U/L)	34.5 (26)	0-35
Alanine aminotransferase (U/L)	24 (23)	0-35
Lactate dehydrogenase#(U/L)	784 (714)	0-248
Sodium (mmol/L)	137 (6)	136-146
Potassium (mmol/L)	4.2 (0.8)	3.5-5.1
Calcium (mg/dL)	9.2 (0.6)	8.8-10.6
Chlorine (mmol/L)	101.5 (7)	101-109
Urine tests*		
Hematuria (n;%)	4 (28.6)	
Proteinuria (n;%)	7 (50)	

#: LDH results were available in 10 patients ; *:Urine analysis results were available in 14 patients

Fourteen patients (70%) had an increased risk of thromboembolic events. The risk factors of patients are presented in Table 3. All patients

were treated conservatively without any surgical intervention and none of the patients died.

Table 3. The thromboembolic risk factors of patients

Risk Factors	n (%)
Atrial fibrillation	8 (40)
Coronary artery disease, heart failure	9 (45)
Hypertension	5 (25)
Diabetes mellitus	2 (10)
Malignancy	1 (5)
Ischemic stroke	2 (10)

Discussion

Renal infarction is a very rare disease and its incidence as a cause of abdominal or flank pain is unknown (11). In addition, this disease may easily be misdiagnosed. It has been reported that only 40% of patients with renal infarction are diagnosed at presentation (7). The main reason for this is that patients often present with non-specific complaints such as flank pain, abdominal pain, nausea, and vomiting, as was the case in our study (12). These complaints usually lead to erroneous diagnoses such as nephrolithiasis, and therefore the diagnosis of renal infarction is often delayed or missed. Emergency physicians should be capable of recognizing the signs leading to the diagnosis of renal infarction. In this sense, there is a need for an effective diagnostic strategy. Perhaps the first and most important step in the diagnosis of renal infarction is to have a high level of suspicion. Especially in patients with concomitant diseases who are prone to thromboembolism, and in patients with laboratory findings (increased serum LDH level, hematuria) suggestive of renal infarction, radiological studies such as contrast-enhanced CT should be performed as soon as possible in order to confirm the diagnosis.

Previous case series reported that most patients with renal infarction had a history of embolism, ischemic or valvular heart disease or atrial fibrillation. Among these, atrial fibrillation, in particular, was highlighted as an important risk factor (3,7,10). Nevertheless, it has been reported that these risk factors may not be present in healthy middle-aged patients with idiopathic renal infarction (9). In this study, about one-third of the patients did not have any risk factors. Most

case reports in the literature stated that the majority of renal infarcts were located on the left kidney, due to the acute angulation between the left renal artery and the aorta. However, in the presented study, most of the renal infarctions (75%) involved the right kidney.

Elevation of serum lactate dehydrogenase (LDH) in conjunction with hematuria is a good indicator of renal infarction (11). Other indicators of renal infarction are leukocytosis and high levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (13). In the study, LDH levels were not available for all patients. However, all patients whose LDH levels were measured had elevated LDH levels. In addition, about one-third of the patients in the study had hematuria in the urine analysis, half of them had elevated liver function tests (AST, ALT), and 70% had elevated levels of urea and creatinine.

Previously, the diagnosis of renal infarction was made by angiography. In the recent years, the use of contrast-enhanced CT has become a helpful tool for confirming the diagnosis of renal infarction (11). Contrast-enhanced CT also enables the physician to evaluate other organs (such as the spleen) for ischemia (14). However, when evaluating a contrast-enhanced CT, caution must be taken to differentiate between acute and chronic renal infarcts. It should also be kept in mind that small infarcts, especially peripheral lesions, may easily be missed.

There is no standard treatment for renal infarction. Treatment is based on the underlying etiology. Conservative treatment with thrombolytic therapy and/or anticoagulant drugs

is often preferred to surgical treatment (3,10,15,16). All patients in the study were treated conservatively without surgical intervention and none of the patients required dialysis.

Conclusion

Renal infarction should be considered in the differential diagnosis in patients with a high risk of embolism (such as a cardiovascular disease) who present to the ED with acute-onset flank pain.

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