EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2026.46548
Eurasian J Emerg Med. 2026;25: 222-7

The Role of the Lactate Dehydrogenase-to-albumin Ratio in Differentiating Acute Renal Infarction from Ureterolithiasis

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Abstract

Aim: Acute renal infarction (ARI) is an uncommon but clinically important vascular emergency that is frequently misdiagnosed as acute ureterolithiasis due to overlapping symptoms. This study aimed to evaluate the diagnostic value of the lactate dehydrogenase-to-albumin (LDH/albumin) ratio in patients with ARI.

Materials and Methods: This study included adult patients diagnosed with ARI between January 2018 and June 2025. ARI was confirmed using contrast-enhanced computed tomography. A control group of patients with acute ureterolithiasis was selected using 2:1 propensity score matching on age and sex. Demographic variables, clinical features, and laboratory parameters were compared. Univariate and multivariate logistic regression analyses were performed to identify independent predictors of ARI. Diagnostic performance was assessed using ROC curve analysis.

Results: A total of 162 patients were included, comprising 54 with ARI and 108 with ureterolithiasis. Patients with ARI showed significantly higher LDH levels and LDH/albumin ratios, and lower albumin levels compared with controls. The LDH/albumin ratio demonstrated the strongest association with ARI [odds ratio=3.62; 95% confidence interval (CI): 1.96-6.58]. ROC analysis showed that the LDH/albumin ratio [area under the curve (AUC)=0.921; 95% CI: 0.881-0.963) had superior diagnostic performance compared with LDH (AUC=0.873) and albumin (AUC=0.780). A cut-off value >13.1 yielded a sensitivity of 85.2% and a specificity of 83.3% for identifying ARI.

Conclusion: The LDH/albumin ratio demonstrates superior diagnostic performance compared with LDH or albumin alone because it reflects both tissue ischemia and inflammatory processes. Therefore, it may serve as a valuable and readily accessible biomarker for the early identification of ARI.

Keywords: Acute renal infarction, lactate dehydrogenase, albumin, diagnostic value

Introduction

Acute renal infarction (ARI) is a rare but clinically significant vascular condition resulting from complete or partial occlusion of the renal artery, typically due to embolic or thrombotic events. Delayed diagnosis carries a significant risk of permanent renal damage (1). The low diagnostic rate of ARI in the emergency department (ED) is primarily explained by its non-specific clinical presentation, which frequently leads to misdiagnosis as urolithiasis. These diagnostic challenges hinder accurate estimation of the true incidence of ARI. The most common underlying etiologies include atrial fibrillation, heart failure, and valvular heart diseases (2). ARI typically presents with acute abdominal or flank pain, often accompanied by characteristic laboratory findings, including elevated serum lactate dehydrogenase (LDH), microscopic hematuria, and elevated creatinine levels (3).

The LDH, a non-specific marker of cellular injury, may rise in a variety of clinical conditions, including myocardial infarction, hemolysis, and acute ischemic renal tubular necrosis (4,5). Therefore, LDH measurement alone is not specific enough to reliably establish the diagnosis of ARI. To improve diagnostic accuracy, LDH should be evaluated in conjunction with additional biochemical parameters. Recently, the LDH/albumin

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Cite this article as: Kankılıç NA, Sert ET, Kokulu K. The role of the lactate dehydrogenase-to-albumin ratio in differentiating acute renal infarction from ureterolithiasis. Eurasian J Emerg Med. 2026;25: 222-7.

Received: 22.01.2026
Accepted: 03.03.2026
Published: 13.03.2026

ratio has been investigated as a prognostic indicator in various conditions characterized by inflammation and tissue injury. In particular, an elevated LDH/albumin ratio has been identified as an independent predictor of mortality in sepsis-associated acute kidney injury (AKI) (6) and has also been reported as a valuable marker for prognostic assessment in critically ill patients with AKI (7). Current evidence suggests that the LDH/albumin ratio may play a role in the diagnosis of ARI, serving as an indicator of cellular injury and inflammation. However, the diagnostic utility of the LDH/albumin ratio for ARI remains poorly defined in the existing literature. Therefore, this study aimed to evaluate the diagnostic value of the LDH/albumin ratio in patients with ARI.

Materials and Methods

Study Design and Patient Selection

This single-center, retrospective, case-control study used data from patients diagnosed with ARI in the ED between January 2018 and June 2025. Inclusion criteria were defined as adult patients (≥18 years) with ARI confirmed by contrast-enhanced abdominal computed tomography (CT). Data extraction was performed through a retrospective review of electronic medical records. The study protocol was approved by the Aksaray University Health Sciences Scientific Research Ethics Committee (decision number: 2025/006, date: 16.01.2025), and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Patients were excluded if they met any of the following criteria: (1) age <18 years; (2) ARI not confirmed by contrast-enhanced CT; (3) insufficient clinical, laboratory, or imaging data; (4) absence of abdominal or flank pain; (5) history of acute or chronic liver disease; (6) presence of sepsis or systemic inflammatory disease; (7) history of malignancy; (8) history of chronic kidney disease or prior renal transplantation; or (9) clinical conditions known to significantly affect LDH levels, such as major trauma, rhabdomyolysis, or myocardial infarction.

Data Collection

Patient demographic characteristics (age, sex), presenting vital signs, chief complaint, comorbidities (e.g., atrial fibrillation, hypertension, diabetes mellitus), and the anatomical location of ARI (right or left kidney) were obtained from electronic medical records. All laboratory parameters, including LDH and albumin levels, were obtained from venous blood samples collected at the time of presentation to the ED. Contrast-enhanced abdominal CT images were obtained using a 128-slice GE Revolution EVO (USA) CT scanner. The ARI group was defined based on contrast-enhanced abdominal CT findings consistent with ARI. The final diagnosis of ARI was established by consensus between an emergency medicine specialist and a urologist, based on a review of the radiologists' abdominal CT reports and the corresponding images. All demographic, laboratory, and imaging data were systematically recorded using a standardized, study-specific data collection form.

The control group consisted of patients with acute ureterolithiasis who presented to the ED with similar symptoms (flank or abdominal pain) during the same period; ARI was excluded by contrast-enhanced CT performed as part of their diagnostic evaluation. To increase the statistical power of the study, the control group was matched to the case group at a 2:1 ratio on age and sex using propensity score matching. This approach reduced the influence of potential confounding variables, thereby enabling a more reliable assessment of the independent diagnostic utility of the LDH/albumin ratio in ARI. The matching process was performed using the nearest-neighbor algorithm with a caliper width of 0.2. The effectiveness of the propensity score matching was confirmed by standardized mean difference values <0.1, indicating a well-balanced distribution between the matched groups. This approach substantially reduced bias and enhanced the reliability of the evaluation of the diagnostic performance of the laboratory indicators.

Statistical Analysis

Statistical analyses were performed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). Categorical variables were presented as frequencies and percentages, and comparisons were conducted using the chi-square test or Fisher's exact test. The distribution of continuous variables was assessed using the Kolmogorov-Smirnov test. Normally distributed continuous data were compared using the Student's t-test and presented as mean ± standard deviation, whereas non-normally distributed data were compared using the Mann-Whitney U test and expressed as median (25^{th}-75^{th} percentile). To investigate the independent association between the LDH/albumin ratio and ARI, a univariate logistic regression analysis was first performed; variables with a p-value <0.05 were then included in a multivariate logistic regression model. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported. The diagnostic performance of the LDH/albumin ratio for ARI was evaluated using ROC curve analysis. The area under the curve (AUC) and its 95% CI were calculated, and the optimal cut-off value was determined using the Youden index. ROC curve AUCs were compared using the DeLong test to assess differences in diagnostic performance between the LDH/albumin ratio and individual biomarkers. Sensitivity, specificity, and positive and negative predictive values were also calculated. For all analyses, a p-value <0.05 was considered statistically significant.

Results

A total of 162 patients who met the eligibility criteria were included in the study. Of these, 108 patients (66.7%) were assigned to the control group (acute ureterolithiasis), and 54 patients (33.3%) were diagnosed with ARI. The median age was 50 (46-55) years in the control group and 53 (47-58) years in the ARI group. Male patients constituted 53.7% of the control group and 55.6% of the ARI group. Flank pain was significantly more common in the control group (80.6% vs. 51.9%; p<0.001), whereas abdominal pain was observed more frequently in the ARI group (74.1% vs. 47.2%; p=0.001). The prevalence of atrial fibrillation was markedly higher in the ARI group compared with controls (27.8% and 9.3%, respectively; p=0.002). Patients with ARI also exhibited significantly elevated white blood cell (WBC) counts (11.7±2.7 and 10.5±1.9, respectively; p=0.001), LDH levels (680±148 and 468±99 U/L, respectively; p<0.001), and LDH/albumin ratio (16.5±3.4 and 10.5±2.3, respectively; p<0.001) (Figure 1). In contrast, albumin levels were lower in the ARI group (41.2±2.9 and 44.6±3.6 g/L, respectively; p<0.001), while hematuria was more frequently observed among control patients (64.8% and 42.6%, respectively; p=0.007) (Table 1).

Abdominal pain OR=2.66; CI=1.55-4.56; p=0.001, atrial fibrillation (OR=3.73; CI=1.62-8.01; p=0.002), and WBC count (OR=1.19; CI=1.05-1.38; p=0.003) were all significantly associated with a higher likelihood of ARI. Among biochemical markers, LDH demonstrated a strong association

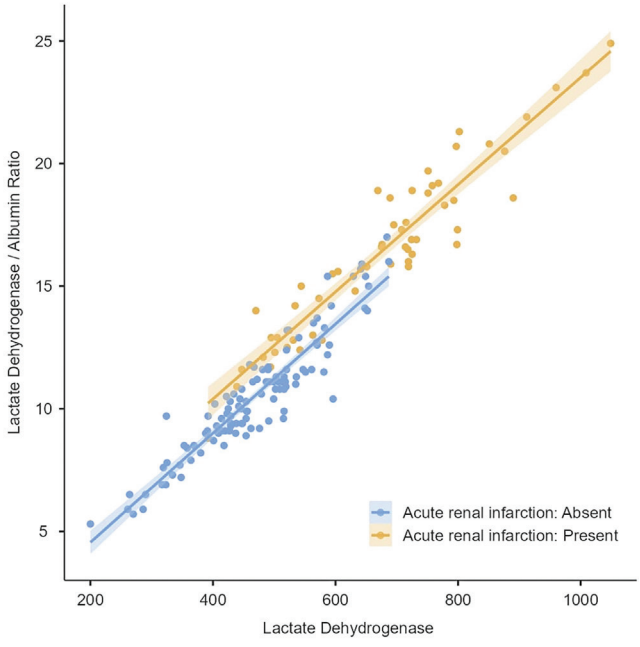

Figure 1. Distribution of patients according to LDH Levels and LDH/albumin ratios by acute renal infarction status

LDH: Lactate dehydrogenase

Table 1. Comparison of patient characteristics between the acute renal infarction group and the acute ureterolithiasis (Control) group

Variables	Control group (n=108)	ARI group (n=54)	p-value
Age, years	50 (46-55)	53 (47−58)	0.106
Male sex	58 (53.7%)	30 (55.6%)	0.823
Vital sign			
SBP, mmHg	132.7±12.1	133.5±12.2	0.704
DBP, mmHg	81.9±6.4	82.6±7.1	0.462
Heart rate, bpm	84 (80-92)	85 (81-94)	0.089
Body temperature, °C	36.8±0.3	36.9±0.4	0.323
Presenting symptoms			
Abdominal pain	51 (47.2%)	40 (74.1%)	0.001
Flank pain	87 (80.6%)	28 (51.9%)	<0.001
Nausea/vomiting	43 (39.8%)	26 (48.1%)	0.312
Fever	6 (5.6%)	5 (9.3%)	0.377
Other	3 (2.8%)	2 (3.7%)	0.748
Past medical history			
Hypertension	31 (28.7%)	17 (31.5%)	0.715
Diabetes mellitus	17 (15.7%)	11 (20.4%)	0.463
Cardiovascular disease	8 (7.4%)	6 (11.1%)	0.429
Atrial fibrillation	10 (9.3%)	15 (27.8%)	0.002
Dyslipidemia	6 (5.6%)	8 (14.8%)	0.072
Ureteral stone	41 (38.0%)	10 (18.5%)	0.012
Side of ARI on CT			
Right	50 (46.3%)	29 (53.7%)	0.374
Left	58 (53.7%)	25 (46.3%)	
Laboratory data (reference range)			
WBC, (4-10 103/mL)	10.5±1.9	11.7±2.7	0.001
Hemoglobin, (11-16 g/dL)	13.0±1.1	13.1±1.2	0.626
Platelet count, (100-400 10^9/L)	246±44	241±31	0.578
Urea, (12-43 mg/dL)	25.5±7.3	27.3±7.4	0.104
Creatinine, (0.67-1.17 mg/dL)	0.89±0.30	0.93±0.29	0.215
AST, (0-50 U/L)	36.4±10.5	38.8±9.1	0.118
ALT, (0-50 U/L)	34.4±9.2	35.1±8.4	0.433
Albumin, (35-52 g/L)	44.6±3.6	41.2±2.9	<0.001
LDH, (0-248U/L)	468±99	680±148	<0.001
CRP, (0-5 mg/L)	3.8±2.9	3.2±2.5	0.456
LDH/albumin ratio	10.5±2.3	16.5±3.4	<0.001
Urinalysis			
Proteinuria	17 (15.7%)	8 (14.8%)	0.878
Hematuria	70 (64.8%)	23 (42.6%)	0.007

Data are expressed as mean ± standard deviation, median (25^{th}-75^{th} quartile) and percentiles or n (%). ARI: Acute renal infarction, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, WBC: White blood cell count, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, CRP: C-reactive protein, LDH: Lactate dehydrogenase, CT: Computed tomography

(OR=2.91; CI=1.80-4.72; p<0.001), while the LDH/albumin ratio emerged as the most powerful predictor (OR=4.85; CI=3.00-7.72; p<0.001). Conversely, flank pain (OR=0.27; CI=0.16-0.44; p<0.001), a history of ureteral stones (OR=0.38; CI=0.18-0.74; p=0.014), lower albumin levels (OR=0.79; CI=0.66-0.94; p<0.001), and hematuria (OR=0.43; CI=0.25-0.70; p=0.006) were significantly associated with reduced odds of ARI (Table 2). Independent predictors of ARI were evaluated using multivariate logistic regression analysis (Table 3). To avoid multicollinearity, LDH and albumin were excluded from the multivariate model, and the LDH/albumin ratio remained the strongest independent predictor of ARI (OR=3.62; CI=1.96-6.58; p<0.001). Atrial fibrillation was the only clinical comorbidity that retained an independent and statistically significant association with ARI (OR=2.46; CI=1.12–5.05; p=0.021). The diagnostic performance of LDH, albumin, and the LDH/albumin ratio in identifying ARI was evaluated using ROC curve analysis (Table 4). The LDH/albumin ratio demonstrated the highest discriminative ability, with an AUC of 0.921 (CI=0.881-0.963), followed by LDH with an AUC of 0.873 (CI=0.820–0.934), and albumin with an AUC of 0.780 (CI=0.711-0.853). A cut-off value of >13.1 for the LDH/albumin ratio yielded a sensitivity of 85.2% and a specificity of 83.3%, indicating strong diagnostic accuracy for distinguishing ARI from ureterolithiasis.

Table 2. Unadjusted associations between clinical and laboratory variables and the presence of acute renal infarction

Variables	OR (95% CI)	p-value
Abdominal pain	2.66 (1.55-4.56)	0.001
Flank pain	0.27 (0.16-0.44)	<0.001
Atrial fibrillation	3.73 (1.62-8.01)	0.002
Ureteral stone	0.38 (0.18-0.74)	0.014
WBC	1.19 (1.05-1.38)	0.003
Albumin	0.79 (0.66-0.94)	<0.001
LDH	2.91 (1.80-4.72)	<0.001
LDH/album ratio	4.85 (3.00-7.72)	<0.001
Hematuria	0.43 (0.25–0.70)	0.006

OR: Odds ratio, CI: Confidence interval, WBC: White blood cell count, LDH: Lactate dehydrogenase

Table 3. Independent predictors of acute renal infarction in multivariate analysis

Variables	OR (95% CI)	p-value
Abdominal pain	1.28 (0.63-2.11)	0.218
Flank pain	0.74 (0.40-1.26)	0.193
Atrial fibrillation	2.46 (1.12-5.05)	0.021
Ureteral stone	0.91 (0.48-1.68)	0.613
WBC	1.07 (0.95-1.22)	0.264
LDH/albumin ratio	3.62 (1.96-6.58)	<0.001
Hematuria	0.82 (0.45-1.50)	0.493

OR: Odds ratio, CI: Confidence interval, WBC: White blood cell count, LDH: Lactate dehydrogenase

Discussion

ARI is a clinically uncommon condition, and current data indicate that an accurate diagnosis is established in only about 40% of patients at the time of presentation (8,9). This low diagnostic rate stems from the non-specific clinical presentation, with symptoms such as sudden-onset flank or abdominal pain, nausea, vomiting, and hematuria (10-12). These symptoms are frequently mistaken for more common clinical conditions, such as nephrolithiasis, ureterolithiasis, cholelithiasis, pyelonephritis, or gastrointestinal infections, and may therefore lead to delays in diagnosis. In this context, clinicians' ability to recognize clinical and laboratory findings suggestive of ARI may play a critical role in facilitating early diagnosis and reducing the risk of irreversible renal injury. Thus, the identification of novel biomarkers that may contribute to the diagnosis of ARI is of considerable clinical importance. Accordingly, this study investigated the diagnostic utility of the LDH/albumin ratio in patients with ARI. We found the LDH/albumin ratio to be the strongest independent predictor of ARI, and it demonstrated the highest diagnostic performance, with an AUC of 0.921 in differentiating ARI from acute ureterolithiasis.

Ischemia, cellular hypoxia, oxidative stress, and the inflammatory response during ARI substantially increase the release of LDH into the plasma. Oxygen deficiency within renal tissue triggers the LDH-mediated conversion of pyruvate to lactate, shifting energy production toward anaerobic metabolism and thereby increasing cellular metabolic stress. Elevated LDH may further promote oxidative stress, while the resulting lactic acid can exacerbate inflammation by influencing the production of nitric oxide and cytokines such as TNF-α and interleukin-6 (13,14). LDH, a marker of cellular necrosis, rises rapidly during renal infarction and may reach levels four to five times the normal level. Although it gradually declines after symptom onset, it typically remains elevated for approximately 15 days (5). However, because LDH levels vary depending on the size and duration of the infarction, establishing a reliable cut-off value based on LDH alone is challenging. Because LDH is present in multiple tissues, various forms of cellular injury can elevate serum LDH levels. This may lead to both false-positive and false-negative interpretations, thereby limiting its diagnostic utility (15). In the literature, elevated serum LDH levels have been reported in more than 70% of patients with ARI (1,16-18). Previous studies have demonstrated associations between ARI and both a history of atrial fibrillation and elevated LDH levels (16,17). Similarly, Zhang and Liu (19) reported that LDH levels

Table 4. Receiver operating characteristic curve analysis for the diagnostic performance of LDH, albumin, and the LDH/albumin ratio in identifying acute renal infarction

Variables	Albumin	LDH	LDH/albumin ratio
AUC (95% CI)	0.780 (0.711-0.853)	0.873 (0.820-0.934)	0.921 (0.881-0.963)
Cut-off value	<41 g/L	>585 U/L	>13.1
Sensitivity (%)	72.2	80.0	85.2
Specificity (%)	70.4	79.6	83.3
+LR	2.44	3.92	5.10
-LR	0.39	0.25	0.18
PPV (%)	57.0	67.5	73.0
NPV (%)	81.5	88.4	92.0

AUC: Area under the curve, CI: Confidence interval, LR: Likelihood ratio, PPV: Positive predictive value, NPV: Negative predictive value, LDH: Lactate dehydrogenase

were frequently elevated in ARI and suggested that this marker may help differentiate ARI from other causes of acute flank pain, including renal colic. Additionally, elevations in aspartate aminotransferase, alanine aminotransferase, and C-reactive protein (CRP) levels have also been reported to be associated with ARI (17,20). In a retrospective study comparing renal infarction and acute ureteral stone cases in the ED, Ahn and Lee (18) reported that advanced age (≥70 years), a history of atrial fibrillation, fever (≥37.5 °C), elevated LDH (≥500 IU/L), low chloride (≤103 mEq/L), low albumin (≤4.3 g/dL), elevated CRP (≥0.23 mg/dL), and the absence of urine erythrocytes were all significan tly associated with an increased probability of ARI. Similarly, in our study LDH levels were significantly higher in the ARI group.

Albumin plays a critical role in renal tissue due to its antioxidant and anti-inflammatory properties. It also helps maintain colloid osmotic pressure, thereby supporting fluid balance, intravascular volume, and tissue perfusion (21-24). Albumin, which interacts with oxidants through its free thiol group, may decrease in plasma levels during acute stress responses, leading to hypoalbuminemia (25-27). The reduction in albumin levels not only contributes to tissue injury by compromising renal endothelial stability but also diminishes the kidney's resistance to oxidative and inflammatory stress by limiting albumin's antioxidant and anti-inflammatory effects (13,28). Therefore, the simultaneous assessment of LDH and albumin may serve as a valuable indicator for the early diagnosis of ARI. The LDH/albumin ratio has recently been recognized as a novel diagnostic and prognostic biomarker across several clinical conditions. Fang et al. (6) reported that the LDH/albumin ratio is an independent risk factor for the development of AKI in patients with sepsis. Mutailifu et al. (13) demonstrated that a high LDH/albumin ratio is associated with in-hospital mortality in aortic dissection, while Chu et al. (29) showed that it has prognostic value for predicting adverse clinical outcomes in patients with ischemic stroke. In our study, we demonstrated that the LDH/albumin ratio was the strongest independent predictor of ARI and showed excellent diagnostic performance, with an AUC of 0.921 for distinguishing ARI from acute ureterolithiasis. These results suggest that including albumin alongside LDH may increase diagnostic accuracy and that albumin may serve as a valuable diagnostic biomarker for clinical decision-making in patients presenting with acute flank pain.

Study Limitations

This study has several limitations. First, it was conducted retrospectively at a single center, which may limit generalizability to broader patient populations. Second, only patients with available LDH and albumin measurements were included, and these biomarkers were assessed at a single time point; therefore, changes over time could not be evaluated. Third, the relatively small number of patients diagnosed with ARI reduced the statistical power. Fourth, the diagnosis of ARI relied exclusively on contrast-enhanced CT; consequently, patients unable to undergo contrast-enhanced CT were excluded, potentially introducing selection bias. Fifth, LDH and albumin levels are influenced by several external factors, including nutritional status, chronic illnesses, and nonspecific tissue injury, all of which may have introduced unmeasured confounding. Another limitation of this study is that serum LDH levels may be influenced by hemolysis; because of the retrospective design, hemolyzed blood samples could not always be reliably identified. Finally, using acute ureterolithiasis alone as the control group limits the generalizability of the LDH/albumin ratio's diagnostic performance to other causes of acute abdominal or flank pain.

Conclusion

Our findings indicate that the LDH/albumin ratio provides superior diagnostic accuracy compared with LDH or albumin alone, likely because it reflects both tissue ischemia and underlying inflammatory processes. Consequently, the LDH/albumin ratio may serve as a valuable and readily accessible biomarker for the early identification of ARI. Further studies are

required to validate its clinical utility and determine its role in routine diagnostic practice.

Ethics

Ethics Committee Approval: The study protocol was approved by the Aksaray University Health Sciences Scientific Research Ethics Committee (decision number: 2025/006, date: 16.01.2025), and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Informed consent was waived due to the retrospective study design.

Footnotes

Authorship Contributions

Surgical and Medical Practices: N.A.K., K.K., E.T.S., Concept: N.A.K., Design: E.T.S., Data Collection or Processing: N.A.K., Analysis or Interpretation: N.A.K., K.K., Literature Search: N.A.K., Writing: N.A.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Çağdaş Ş, Asfuroğlu A, Aykanat İC, Özercan AY, Köseoğlu B, Balcı M, et al. Acute renal infarction: a single-center experience. Eur J Ther. 2022;28:209-13.
2. Oh YK, Yang CW, Kim YL, Kang SW, Park CW, Kim YS, et al. Clinical characteristics and outcomes of renal infarction. Am J Kidney Dis. 2016;67:243-50.
3. Ongun S, Bozkurt O, Demir O, Cimen S, Aslan G. Midterm renal functions following acute renal infarction. Kaohsiung J Med Sci. 2015;31:529-33.
4. Muchtar E, Dispenzieri A, Lacy MQ, Buadi FK, Kapoor P, Hayman SR, et al. Elevation of serum lactate dehydrogenase in AL amyloidosis reflects tissue damage and is an adverse prognostic marker in patients not eligible for stem cell transplantation. Br J Haematol. 2017;178:888-95.
5. Farhana A, Lappin SL. Biochemistry, lactate dehydrogenase. 2023 May 1. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan.
6. Fang Y, Zhang Y, Zhang X. The elevated lactate dehydrogenase to albumin ratio is a risk factor for developing sepsis-associated acute kidney injury: a single-center retrospective study. BMC Nephrol. 2024;25:201.
7. Deng Y, Li X, Lai Q, Wang F, Zhang C, Yang Y, et al. Prognostic implication of lactic dehydrogenase-to-albumin ratio in critically ill patients with acute kidney injury. Clin Exp Nephrol. 2023;27:349-57.
8. Korzets Z, Plotkin E, Bernheim J, Zissin R. The clinical spectrum of acute renal infarction. Isr Med Assoc J. 2002;4:781-4.
9. Hazanov N, Somin M, Attali M, Beilinson N, Thaler M, Mouallem M, et al. Acute renal embolism. Forty-four cases of renal infarction in patients with atrial fibrillation. Medicine (Baltimore). 2004;83:292-9.
10. Ahn SB, Lee JY. Clinical differentiation between acute renal infarction and acute ureteral stone in the emergency department: a single-center retrospective case-control study. Am J Emerg Med. 2021;50:322-9.
11. Bourgault M, Grimbert P, Verret C, Pourrat J, Herody M, Halimi JM, et al. Acute renal infarction: a case series. Clin J Am Soc Nephrol. 2013;8:392-8.
12. Sert ET, Kokulu K. Relationship between microscopic haematuria and hydronephrosis in urolithiasis. Int J Clin Pract. 2021;75:e14688.
13. Mutailifu S, Zhu Q, Wang M, Zhang D, Song S, Li N. Association between lactate dehydrogenase/albumin ratio and in-hospital mortality in patients with acute aortic dissection. J Inflamm Res. 2025;18:6281-92.
14. Colgan SM, Mukherjee S, Major P. Hypoxia-induced lactate dehydrogenase expression and tumor angiogenesis. Clin Colorectal Cancer. 2007;6:442-6.
15. Fort J, Segarra A, Matas M, Segarra A, Camps J. Renal artery embolism: prospective study of 41 patients based on a diagnostic and therapeutic algorithm. The Open Urology & Nephrology Journal al. 2008;1:9-15.
16. Eltawansy SA, Patel S, Rao M, Hassanien S, ManiarM. Acute renal infarction presenting with acute abdominal pain secondary to newly discovered atrial fibrillation: a case report and literature review. Case Rep Emerg Med. 2014;2014:981409.
17. AntopolskyM, Simanovsky N, Stalnikowicz R, Salameh S, Hiller N. Renal infarction in the ED: 10-year experience and review of the literature. Am J Emerg Med. 2012;30:1055-60.
18. Nah S, Han S, Kim HB, Chun S, Kim S, Woo S, et al. Predictors of renal infarction in patients presenting to the emergency department with flank pain: a retrospective observational study. PLoS One. 2021;16:e0261054.
19. Zhang ZG, Liu XM. Clinical characteristics of patients with acute renal infarction: an analysis of 52 patients in a single center. Beijing Da Xue Xue Bao Yi Xue Ban. 2019;51:863-9.
20. Yang J, Lee JY, Na YJ, Lim SY, Kim MG, Jo SK, et al. Risk factors and outcomes of acute renal infarction. Kidney Res Clin Pract. 2016;35:90-5.
21. Sheinenzon A, Shehadeh M, Michelis R, Shaoul E, Ronen O. Serum albumin levels and inflammation. Int J Biol Macromol. 2021;184:857-62.
22. Bai Z, Bernardi M, Yoshida EM, Li H, Guo X, Méndez-Sánchez N, et al. Albumin infusion may decrease the incidence and severity of overt hepatic encephalopathy in liver cirrhosis. Aging. 2019;11:8502-25.
23. Özgür Y, Akın S, Yılmaz NG, Gücün M, Keskin Ö. Uric acid albumin ratio as a predictive marker of short-term mortality in patients with acute kidney injury. Clin Exp Emerg Med. 2021;8:82-8.
24. Garcia-Martinez R, Caraceni P, Bernardi M, Gines P, Arroyo V, Jalan R. Albumin: pathophysiologic basis of its role in the treatment of cirrhosis and its complications. Hepatology. 2013;58:1836-46.
25. Zoanni B, Brioschi M, Mallia A, Gianazza E, Eligini S, Carini M, et al. Novel insights about albumin in cardiovascular diseases: focus on heart failure. Mass Spectrom Rev. 2023;42:1113-28.
26. Sert ZS, Yılmaz SA, Seçilmiş Ö, Abuşoğlu S, Ünlü A, Çelik Ç. Effect of calcium and vitamin D supplementation on the clinical, hormonal, and metabolic profile in non-obese women with polycystic ovary syndrome. Ir J Med Sci. 2022;191:2657-62.
27. Levitt DG, Levitt MD. Human serum albumin homeostasis: a new look at the roles of synthesis, catabolism, renal and gastrointestinal excretion, and the clinical value of serum albumin measurements. Int J Gen Med. 2016;9:229-55.
28. Arques S. Serum albumin and cardiovascular disease: state-of-the-art review. Ann Cardiol Angeiol. 2020;69:192-200.
29. Chu M, Niu H, Yang N, Wang D, Liu Y, Mao X, et al. High serum lactate dehydrogenase to albumin ratio is associated with increased risk of poor prognosis after ischemic stroke. Clin Neurol Neurosurg. 2024;237:108120.