ORIGINAL ARTICLE

Pro-adrenomedullin: a novel diagnostic biomarker of acute appendicitis

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ABSTRACT

BACKGROUND: The objective of this study was to evaluate the diagnostic value of serum pro-adrenomedullin (pro-ADM) levels in diagnosing acute appendicitis (AA) in patients presenting to the emergency department (ED) with abdominal pain.

METHODS: This prospective clinical study included patients over the age of 18 who presented to the ED with abdominal pain and were initially suspected of having appendicitis. A venous blood sample was collected from each patient upon presentation, and serum pro-ADM levels were measured. Based on laboratory and radiological evaluations, patients were categorized into two groups: those diagnosed with AA and those without AA. The AA group was further subdivided into simple and complicated AA. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 21.0 (SPSS Inc., Chicago, IL, USA). A p-value of <0.05 was considered statistically significant.

RESULTS: This study included 83 adult patients with abdominal pain, of whom 44 were male (53.0%) and 39 were female (47.0%). The mean age of the patients was 32.28±16.10 years. Serum pro-ADM levels were higher in patients with appendicitis than in those without. Setting the cut-off value for pro-ADM at 3.375 pg/mL to identify patients with appendicitis revealed a statistically significant difference between patients with and without appendicitis (p=0.002). Additionally, there was a statistically significant difference in serum pro-ADM levels when comparing the duration of ED presentation among patients with appendicitis (p<0.001).

CONCLUSION: Serum pro-ADM levels are elevated in patients with appendicitis; however, pro-ADM is less effective in distinguishing between simple and complicated appendicitis. Serum pro-ADM levels in patients who present to the ED within the first 24 hours of abdominal pain onset may be useful for early diagnosis.

Keywords: Acute abdominal pain; acute appendicitis; emergency department; biomarker; pro-adrenomedullin.

INTRODUCTION

Acute abdominal pain accounts for 7-10% of all emergency department (ED) visits.[1] The most common cause of pain in patients presenting to the emergency department with abdominal pain is acute appendicitis.[2] The lifetime risk of developing acute appendicitis is 8.6% in males and 6.9% in females.[3] Pain associated with appendicitis typically begins around the umbilical region and migrates to the right lower quadrant as inflammation progresses.[4] Numerous scientific studies have been conducted to diagnose acute and complicated appendicitis using inflammatory biomarkers. Various biomarkers, including white blood cell (WBC) count, neutrophil count, neutrophil-to-lymphocyte ratio, immature granulocyte count,

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immature granulocyte percentage, bilirubin, C-reactive protein (CRP), procalcitonin, and D-dimer, have been utilized in these studies.[5-8]

Adrenomedullin (ADM) is a peptide hormone composed of 52 amino acids and is produced by various tissues in the body under stress conditions. It has vasodilatory, immunomodulatory, metabolic, and bactericidal properties.[9,10] ADM is released through the rapid degradation of the stable midregion of its precursor, pro-adrenomedullin (pro-ADM). ADM exerts its vasodilatory effect by increasing cyclic adenosine monophosphate levels in vascular smooth muscle cells and enhancing nitric oxide levels in endothelial cells. During hypoxia and inflammation, serum levels of ADM rise, leading to the release of proinflammatory cytokines. The normal plasma level of ADM ranges from 1 to 10 ng/L.[11] Pro-ADM has been investigated as a biomarker for the diagnosis and prognosis of pneumonia, septic shock, early detection of renal injury, prognosis determination in patients hospitalized due to Coronavirus Disease 2019 (COVID-19), and the diagnosis of acute appendicitis (AA) in pediatric populations.[9-18] However, there are no scientific studies examining the role of ADM in the diagnosis of AA in adults. Our study aimed to evaluate whether pro-ADM could be used as a biomarker for diagnosing acute appendicitis in adult patients presenting to the ED with abdominal pain.

MATERIALS AND METHODS

Patients and Procedures

This prospective clinical study was conducted in the Adult ED of Ondokuz Mayıs University Hospital. Informed consent was obtained from all patients prior to participation. The study adhered to the principles of the Declaration of Helsinki and was approved by the local ethics committee (Ondokuz Mayıs University Clinical Research Ethics Committee; date: 06.09.2022; issue number: 2022/413). Financial support for this study was provided by the Ondokuz Mayıs University Scientific Research Project Unit (PYO.TIP.1904.23.009). The study group consisted of patients who presented to the ED with complaints of acute abdominal pain. This study included 83 adult patients (aged >18 years) who presented to the ED with abdominal pain and were suspected of having AA after initial evaluation between October 2022 and October 2023.

The exclusion criteria were as follows: (1) age under 18 years; (2) abdominal pain following abdominal trauma; (3) onset of abdominal pain more than 48 hours prior to presentation; (4) history of appendectomy; (5) abdominal surgery other than appendectomy within the past three months; (6) use of anticoagulant agents; (7) recent antibiotic and steroid therapy within the past month; (8) presence of cardiac or respiratory failure; (9) history of cerebrovascular disease; (10) pregnancy; (11) recent childbirth; and (12) presence of an existing psychiatric disorder.

All patient data were obtained from records in the automated information system and recorded on forms specially prepared for the study. These forms included patients' demographic characteristics (age and gender), abdominal examination findings (defense, rebound, tenderness, rigidity), time to presentation to the ED after the onset of abdominal pain (categorized as 0-24 hours or 24-48 hours), complete blood count results (including hemoglobin level, white blood cell count, platelet count, neutrophil count, lymphocyte count, platelet-to-lymphocyte ratio, neutrophil-to-lymphocyte ratio, and systemic immune-inflammatory index), emergency biochemical tests, CRP level, pro-ADM level, imaging methods, length of hospital stay, and final patient outcome (discharge or recovery).

Initial clinical diagnosis was made based on the patient's history, physical examination, laboratory tests, and direct abdominal radiography. Following the initial evaluation, abdominal ultrasonography and/or abdominal computed tomography were performed to confirm the diagnosis in patients suspected of having acute appendicitis. Ultrasonography examinations were conducted using a Sonolayer SSA-270A (Toshiba, Japan) sonography device with a 3.75 MHz convex probe and were performed by radiology specialists. On ultrasonography, findings such as a noncompressible appendix with a double-wall thickness greater than 6 mm, focal pain over the appendix upon compression, appendicolith, increased echogenicity of inflamed periappendiceal fat, and fluid in the right lower quadrant were considered positive signs of acute appendicitis.[19] Computed tomography (CT) examinations were carried out using a spiral CT scanner (Xpres/GX, TSX-002a, Toshiba, Japan). A scout image was obtained with the patient lying supine, and the area from the lower thoracic level to the pubic symphysis was defined as the examination field. On CT, findings such as an enlarged appendix with a double-wall thickness greater than 6 mm, appendiceal wall thickening greater than 2 mm, periappendiceal fat stranding, appendiceal wall enhancement, and appendicolith were considered positive signs of acute appendicitis.[20]

Patients who did not show any signs of AA on imaging comprised the non-appendicitis abdominal pain group (Group II, n=16). The AA group (Group I, n=67) was further divided into two subgroups: patients with simple AA (n=47) and those with complicated AA (n=20). Among the non-appendicitis abdominal pain group, 10 patients were diagnosed with nonspecific abdominal pain, four with colitis, one with ileitis, and one with mesenteric lymphadenitis.

Histopathological examination was performed on specimens from all patients who underwent surgery after presenting to the ED. Based on the extent of appendiceal involvement, patients were categorized as having either simple or complicated AA. The simple acute appendicitis group included patients with inflammation limited to the appendix and its surrounding tissues, as identified by imaging and/or histopathological examination. In contrast, the complicated AA group comprised patients who, in addition to inflammation around the appendix, presented with conditions such as gangrene, phlegmon, periappendiceal abscess, free fluid, or perforation, or whose histopathological examination revealed necrotizing, suppurative, or perforated appendicitis.

Laboratory Assays

Peripheral venous blood samples were collected from patients suspected of having AA upon presentation, and emergency biochemical investigations and complete blood counts were performed. Additionally, to determine serum pro-adrenomedullin levels, a 5 mL venous blood sample was collected at the same time. The serum was separated and stored at −80°C in a deep freezer until analysis. Pro-adrenomedullin levels were measured after the serum samples were dissolved. Serum human pro-adrenomedullin levels were measured by ELISA (enzyme-linked immunosorbent assay) using an assay kit (Sunlong Biotech Co. Ltd., Cat No. SL2115Hu, Zhejiang, China). A sandwich immunoassay technique was employed for these measurements.

Statistical Analysis

The minimum number of patients required for the study was determined by power analysis. For pro-adrenomedullin, with d=0.12, σ=0.05, α=0.05, and a power of 95%, the minimum sample size was n=6.[17] All statistical calculations were performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 21.0 (SPSS Inc., Chicago, Illinois, USA). In the statistical analyses, the conformity of measured variables to a normal distribution was assessed using the Kolmogorov-Smirnov test. Variables that did not follow a normal distribution were analyzed using the Kruskal-Wallis nonparametric test. Hourly pro-ADM levels of patients diagnosed with acute appendicitis were compared using the Mann-Whitney U test. Spearman's rank correlation coefficient was used for correlation analysis. Receiver Operating Characteristic (ROC) analysis was performed to determine optimal cut-off values. Fisher's exact probability test was used to compare categorical variables. For all statistical tests, p<0.05 was considered significant.

RESULTS

In the present study, a total of 143,767 patients visited the ED of our hospital over a 12-month period, and 12,639 of

Table 1. Pre- and post-treatment radiographic analysis data for regenerative endodontic procedure (REP) and mineral trioxide aggregate (MTA) apical plug applied groups

Variables	Acute Appendicitis (Group I, n=67)	No Acute Appendicitis (Group II, n=16)	p value
Age (years)			
	32.5±15.8	39.3±18.2	0.301
Sex*			
Female	29 (43.2%)	10 (62.5%)	0.265
Male	38 (56.7%)	6 (37.5%)	0.265
Physical examination*			
Tenderness	64 (95.5%)	14 (20.8%)	0.254
Defense	25 (37.3%)	0 (0.0%)	0.005
Rebound	22 (32.8%)	0 (0.0%)	0.010
Symptom duration, h			
0-24	37 (55.2)	10 (62.5)	0.780
24-48	30 (44.7)	6 (37.5)	0.780
Imaging methods*			
Direct radiography	62 (92.5%)	10 (62.5%)	0.016
US	52 (77.6%)	8 (50.0%)	0.058
CT	64 (95.5%)	5 (31.5%)	<0.001
Both US and CT	49 (73.13%)	3 (18.75%)	<0.001
Mean length of hospital stay (days)	1.4	2.1	<0.001
Final outcome*			
Discharged	66 (98.5)	16 (100.0)	1.000
Fatality	1 (1.4)	0 (0.0)	1.000

*Variables are presented as n (%).

these patients presented with abdominal pain. This study was conducted on 83 adult patients who presented to the ED with complaints of abdominal pain and were suspected of having AA after initial evaluation. The baseline demographic and clinical characteristics of the patients are presented in Table 1. Of the 83 patients, 44 were male (53.0%) and 39 were female (47.0%). The mean age of the patients was 35.8±17.2 years.

Patients with abdominal pain were divided into two groups: Group I included 67 patients with AA, and Group II included 16 patients without AA. The groups were compared in terms of pro-ADM, white blood cell count, neutrophil count, serum total bilirubin, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, systemic immune-inflammatory index (SII), and CRP values at the time of admission (Table 2).

While serum pro-ADM levels were elevated in patients with AA, they were lower in patients without appendicitis. The mean serum pro-ADM level was 4.118 pg/mL in patients not diagnosed with AA, 49.99 pg/mL in patients diagnosed with acute appendicitis, and 40.80 pg/mL in patients with complicated acute appendicitis. The difference between the groups was statistically significant (Fig. 1).

When serum pro-ADM levels were compared according to the time of hospital admission, a statistically significant difference was observed ($p<0.001$). In the 37 cases of AA presenting within the first 24 hours, the serum pro-ADM level was 63.26±58.88 pg/mL, whereas in the 30 cases presenting within 24-48 hours, the serum pro-ADM level was 26.85±46.24 pg/mL (Fig. 2). When the cut-off value of pro-ADM for diagnosing AA was set at 3.375 pg/mL, the sensitivity was 82.0%, specificity was 67.0%, positive predictive value was 80.6%, and negative predictive value was 62.5% (Table 3). According to ROC analysis, the area under the curve was 0.794 (95% confidence interval [CI], 0.682-0.905) (Fig. 3).

Using cut-off values of 3.375 pg/mL for pro-ADM and 5.4 mg/L for CRP, the sensitivity for diagnosing AA was 97.7%, specificity was 77.7%, positive predictive value was 95.6%, and negative predictive value was 87.5% (Table 4).

Using cut-off values of 3.375 pg/mL for pro-ADM and 6.60 k/µL for neutrophil count resulted in a sensitivity of 98.0%, specificity of 73.0%, positive predictive value of 94.2%, and negative predictive value of 88.8% for diagnosing AA (Table 5).

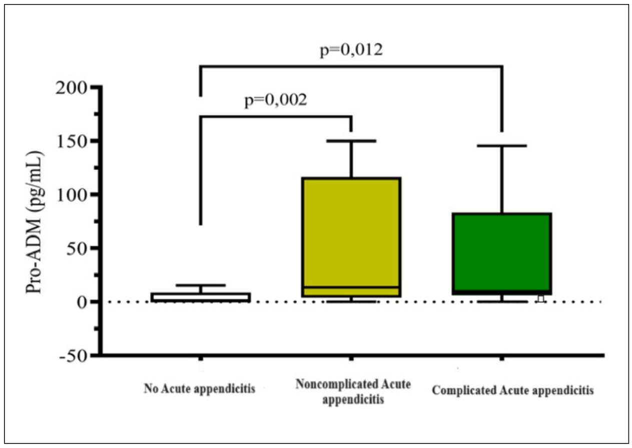

Figure 1. Pro-ADM levels of patients without appendicitis and patients with AA.

Table 2. Laboratory values of patients at the time of presentation to the Emergency Department (ED)

Variables	No Acute Appendicitis (n=16)	Noncomplicated Acute Appendicitis (n=47)	Complicated Acute Appendicitis (n=20)
Pro-adrenomedullin (pg/mL)	4.118	49.99	40.80
Hemogram (g/dL)	13.44±1.87	13.82±1.85	13.60±2.34
White blood cell count (bin/µL)	10.32±3.54	13.93±4.11**	15.15±4.38**
Neutrophil count (bin/µL)	7.25±3.40	11.00±3.88**	12.28±4.80**
Lymphocyte count (bin/µL)	1.94±0.78	1.93±0.87	1.88±0.85
Platelet count (bin/µL)	261.80±52.94	267.90±76.72	241.60±54.21
Serum total bilirubin (mg/L)	0.36±0.15	0.57±0.35*	0.72±0.29***
CRP (mg/L)	15.73±20.63	48.09±63.19*	63.60±65.90**
Neutrophil-to-lymphocyte ratio	4.24±2.73	7.42±6.67*	9.22±7.16*
Platelet-to-lymphocyte ratio	152.00±54.05	174.40±109.70	169.30±117.60
SII	1094.0±670.0	2088.0±1974.0*	2583.0±247.0*

CRP: C-reactive protein; SII: Systemic immune-inflammation index [(Platelets x Neutrophils) / Lymphocytes]. *p<0.05; **p<0.01; ***p<0.001.

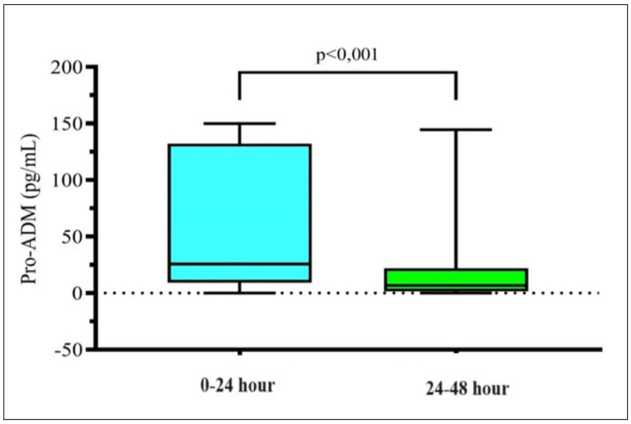

Figure 2. Comparison of serum pro-ADM levels of patients with AA according to the time of presentation.

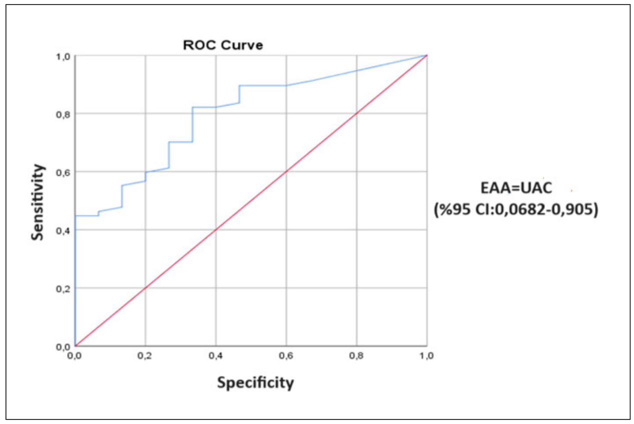

Figure 3. ROC graph of serum pro-ADM value in the diagnosis of AA. **EAA=UAC:Eğri altında kalan alan.*

Table 3. Comparison of patients' serum pro-adrenomedullin (pro-ADM) levels with radiological and pathological results

	Radiological and pathological diagnosis of acute appendicitis		
	Positive	**Negative**	**Total**
Serum pro-ADM level ≥ 3.375 pg/mL	54	6	60
Serum pro-ADM level < 3.375 pg/mL	13	10	23
Total	67	16	83

Table 4. Comparison of serum pro-adrenomedullin (pro-ADM) and C-reactive protein (CRP) levels in patients diagnosed with and without appendicitis after radiological and pathological examinations

	Radiological and pathological diagnosis of acute appendicitis		
	Positive	**Negative**	**Total**
Serum pro-ADM level ≥ 3.375 pg/mL and Serum CRP level ≥ 5.4 mg/L	44	2	46
Serum pro-ADM level < 3.375 pg/mL and Serum CRP level < 5.4 mg/L	1	7	8
Total	45	9	54

Table 5. Comparison of serum pro-adrenomedullin (pro-ADM) and neutrophil levels in patients diagnosed with and without appendicitis after radiological and pathological examinations

	Radiological and pathological diagnosis of acute appendicitis		
	Positive	**Negative**	**Total**
Serum pro-ADM level ≥ 3.375 pg/mL and Serum neutrophil level ≥ 6.60 bin/µL	49	3	52
Serum pro-ADM level < 3.375 pg/mL and Serum neutrophil level < 6.60 bin/µL	1	6	7
Total	50	9	59

DISCUSSION

When diagnosing acute appendicitis in patients presenting to the ED with abdominal pain, physicians rely not only on patient history and physical examination but also on laboratory tests and advanced diagnostic imaging methods, such as abdominal ultrasound and CT. The need for advanced diagnostic imaging arises because more than 40.0% of patients with non-appendicitis-related abdominal pain may present with signs of peritoneal irritation on physical examination.[21] Therefore, patients presenting to primary or secondary healthcare facilities with signs of peritoneal irritation can pose a diagnostic challenge for physicians, as advanced diagnostic imaging may not always be available at these centers to confirm a diagnosis of AA. As a result, physicians working in such settings often need to refer patients with peritoneal irritation to higher-level facilities for further evaluation. However, the time required to transfer patients to a higher-level center can adversely affect their clinical condition. Thus, there is a need for new biomarkers that can enable physicians at primary and secondary healthcare facilities to diagnose AA early and safely.

Biomarkers are biomolecules that are quantitatively measured and used to assess a pathogenic process or the response to treatment.[22] In our review of the literature, we observed that various biomarkers, such as WBC, CRP, interleukin-6 (IL-6), procalcitonin, bilirubin, granulocyte colony-stimulating factor (G-CSF), irisin, and others, have been evaluated in the diagnosis of AA.[5,8,23-25] The most commonly used biomarkers for diagnosing AA include neutrophil count, leukocyte count, and CRP.[26] However, none of these biomarkers alone have proven to be predictive for the early diagnosis of AA, as their sensitivity and specificity are low. Therefore, to reliably diagnose AA, these biomarkers need to be evaluated in combination. In recent years, there has been a growing trend in clinical research toward developing new biomarkers for diagnosing AA. One study conducted in children suspected of having AA evaluated multiple laboratory biomarkers together. When pro-ADM and CRP were assessed together in children suspected of AA, the sensitivity of pro-ADM was reported to be 100.0% and the specificity 61.0%; when pro-ADM was evaluated alongside neutrophil count, the sensitivity was 97.0% and the specificity 74.0%.[9] In our study, we investigated whether pro-ADM contributes to the diagnosis of AA in adults. When pro-ADM was evaluated together with CRP for the diagnosis of AA, it showed a sensitivity of 98.0%, a specificity of 78.0%, a positive predictive value of 96.0%, and a negative predictive value of 88.0% (Table 4). When pro-ADM was evaluated together with neutrophil count, the sensitivity was 98.0%, specificity was 73.0%, positive predictive value was 94.0%, and negative predictive value was 89.0% (Table 5). Our study results are consistent with the literature. Low serum levels of CRP, neutrophils, and pro-ADM are useful biomarkers for ruling out AA.

In our study, we observed that serum pro-ADM levels in venous blood samples collected from patients presenting to the ED with abdominal pain were significantly higher in those with AA compared than in those without appendicitis ($p<0.001$). However, no significant difference was observed in serum pro-ADM levels between patients with simple and complicated AA ($p>0.05$). In a study conducted on 136 pediatric patients suspected of having AA, serum pro-ADM levels were reported to be higher in patients with appendicitis than in those without.[9] In another large multicenter prospective study evaluating pro-ADM as a diagnostic biomarker for AA in 285 children with acute abdominal pain, of whom 103 were diagnosed with AA, serum pro-ADM levels were also higher in patients with appendicitis than in those without.[17] Similarly, in our study, we found that serum pro-ADM levels were higher in patients with AA compared to those without appendicitis.

Acute appendicitis typically results from obstruction of the appendiceal lumen, and the increase in intraluminal pressure can lead to ischemic necrosis (gangrene) or perforation of the appendix. Tissue gangrene or perforation paves the way for bacterial invasion. It has been reported that bacterial invasion through the portal system to the hepatic parenchyma can obstruct the excretion of bilirubin into the bile canaliculi, leading to elevated serum bilirubin levels.[27] Recent clinical studies have consistently shown that complicated appendicitis occurs in 30.4% to 34.7% of patients with AA, with an associated increase in total and/or direct bilirubin levels in the serum of these patients. This increase in bilirubin has been suggested as a noninvasive marker supporting the diagnosis of complicated AA. However, it has also been reported that elevated bilirubin levels alone are not sufficient as an independent marker for complicated AA.[7,8,24,27-30] In our study, we similarly observed increased bilirubin levels in patients with AA, with more pronounced elevations in those with complicated appendicitis.

Míguez et al.[9] reported that among 136 pediatric patients presenting to the ED with abdominal pain, 53 (38.9%) were diagnosed with AA, including nine cases of perforated appendicitis. In that study, pro-ADM levels in children with AA were compared with those in children with nonspecific abdominal pain, and a significant difference was observed between the two groups (0.54 nmol/L and 0.37 nmol/L, respectively). The study also compared pro-ADM levels in perforated and nonperforated cases of AA, finding higher levels in perforated cases (0.564 nmol/L vs. 0.492 nmol/L), although this difference was reported to have no clinical significance. In this study, pro-ADM levels were also compared according to the time of presentation to the ED, with mean serum pro-ADM levels of 0.495 nmol/L for presentations within 24 hours, 0.667 nmol/L for presentations within 24-48 hours, and 0.354 nmol/L for presentations after 72 hours.

In our study, when serum pro-ADM levels in patients with AA were compared according to the time of onset of abdominal pain, the mean serum pro-ADM level was 63.26±58.88 pg/mL for presentations within the first 24 hours and 26.85±46.24

pg/mL for presentations between 24 and 48 hours, with a statistically significant difference based on time of presentation (p<0.001). Míguez et al.[9] also reported that serum pro-ADM levels remained elevated for 48 hours in children with AA and then began to decline. In our study, we observed a decrease in serum pro-ADM levels when the time to presentation exceeded 24 hours. We believe this difference may be related to the age difference between the study populations. The significance of pro-ADM in predicting infection-related organ failure has been investigated, with reports indicating that pro-ADM levels increase in the early stages (within the first 24 hours) and that pro-ADM can predict sepsis up to 24 hours in advance.[31] Although our study supports the use of pro-ADM in the early diagnosis of AA, discrepancies exist in the literature regarding the elevation of serum pro-ADM levels. We believe that these discrepancies may be due to differences in patient populations and variations in measurement methodologies, and further studies are needed to clarify these inconsistencies.

Limitations

This study has several limitations. First, it was conducted at a single center with a limited number of patients. Second, blood samples for pro-ADM measurement were stored at -80°C until the day of analysis; therefore, pro-ADM was not measured concurrently with other biomarkers. Finally, although there was a plan to measure pro-ADM levels in a healthy control group, budget constraints prevented the inclusion of such a group.

CONCLUSION

Pro-ADM may be a useful biomarker for the early diagnosis of AA in adult patients. However, its ability to distinguish between simple and complicated appendicitis is limited. The combined use of biomarkers (pro-ADM, CRP, neutrophil count, bilirubin, neutrophil-to-lymphocyte ratio [NLR], and SII) enhances diagnostic accuracy in diagnosing and excluding acute appendicitis. Considering the specific limitations of this pilot study, we believe that further multicenter studies with larger sample sizes will better elucidate the role of pro-ADM in diagnosing AA.

Ethics Committee Approval: This study was approved by the Ondokuz Mayıs University Clinical Research Ethics Committee Ethics Committee (Date: 06.09.2022, Decision No: 2022/413).

Informed Consent: Written informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: Ş.A.T., A.B.; Design: Ş.A.T., A.B.; Supervision: Ş.A.T.; Resource: A.B.; Materials: Ş.A.T.; Data collection and/or processing: Ş.A.T.; Analysis and/or interpretation: Ş.A.T., Ö.K.T.; Literature review: Ş.A.T., S.S.Y.; Writing: Ş.A.T., A.B.; Critical review: A.B., S.S.

Conflict of Interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Pro-adrenomedullin: Akut apandisit için yeni bir tanı biyobelirteci

AMAÇ: Karın ağrısı şikâyetiyle acil servise (AS) başvuran hastalarda, serum pro-adrenomedullin (Pro-ADM) düzeylerinin akut apandisit (AA) tanısındaki değerini değerlendirmek.

GEREÇ VE YÖNTEM: Bu prospektif klinik çalışmaya, 18 yaş üstü ve acil servise karın ağrısı nedeniyle başvuran, başlangıçta apandisit şüphesi bulunan hastalar dâhil edildi. Her hastadan başvuru sırasında venöz kan örneği alındı ve serum Pro-ADM düzeyleri ölçüldü. Laboratuvar ve radyolojik değerlendirmelere göre hastalar iki gruba ayrıldı: AA tanısı konulanlar ve konulmayanlar. AA tanısı konulanlar ayrıca basit ve komplike AA olarak alt gruplara ayrıldı. Tüm istatistiksel analizler, SPSS for Windows sürüm 21.0 (SPSS Inc., Chicago, IL, ABD) programı kullanılarak yapıldı. $p<0.05$ değeri istatistiksel olarak anlamlı kabul edildi.

BULGULAR: Çalışmaya karın ağrısı olan toplam 83 erişkin hasta dâhil edildi; bunların 44'ü erkek (%53.0), 39'u kadındı (%47.0). Hastaların yaş ortalaması 32.28±16.10 yıl idi. Apandisit tanısı alan hastalarda serum Pro-ADM düzeyleri, tanı almayanlara göre daha yüksekti. Pro-ADM için eşik değerin 3.375 pg/mL olarak belirlenmesi, apandisit tanısı konulan ve konulmayan hastalar arasında istatistiksel olarak anlamlı bir fark ortaya koydu ($p=0.002$). Ayrıca, apandisit tanısı alan hastaların acil servise başvuru süreleriyle serum Pro-ADM düzeyleri arasında da anlamlı bir ilişki saptandı ($p<0.001$).

SONUÇ: Serum Pro-ADM düzeyleri, apandisitli hastalarda yükselmektedir ancak basit ve komplike apandisit ayrımında yeterince etkili değildir. Bununla birlikte, karın ağrısı başlangıcının ilk 24 saati içinde acil servise başvuran hastalarda Pro-ADM düzeyleri, erken tanıda faydalı olabilir.

Anahtar sözcükler: Acil servis; akut apandisit; akut karın ağrısı; biyobelirteç; pro-adrenomedullin.

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