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Original Article

Is there a relationship between the time from emergency admission to diagnosis and patient outcome in patients diagnosed with aortic dissection in the emergency department?

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Abstract

Aim: Aortic dissection is a life-threatening emergency caused by a tear in the aortic intima, leading to separation of the vessel wall layers. It is more frequently observed in males and is associated with high morbidity and mortality. Early diagnosis is considered critical; however, its direct impact on clinical outcomes remains controversial. This study aimed to investigate the relationship between the time from emergency department admission to diagnosis and patient outcomes in cases of aortic dissection, and to evaluate the effect of early diagnosis on clinical prognosis.

Materials and Methods: This retrospective observational study included 35 patients diagnosed with aortic dissection between January 1, 2018, and January 1, 2025. Demographic characteristics, presenting symptoms, time to diagnosis, consultation and hospitalization times, and in-hospital outcomes were recorded. Statistical analyses were performed using SPSS version 26.0. Intergroup comparisons were conducted using mixed-design ANOVA, and a p-value of <0.05 was considered statistically significant.

Results: The mean age of the patients was 67.8±14.0 years, and 60% were male. Chest pain was the most common presenting symptom (40%). Emergency surgery was performed in 54.3% of patients, 88.6% required intensive care unit admission, and in-hospital mortality was 34.3%. No statistically significant association was found between patient outcomes and the time from admission to consultation or hospitalization ($p>0.05$). However, within-group analyses revealed significant differences between consultation time and hospitalization time.

Conclusion: Time to diagnosis alone did not demonstrate a direct effect on clinical outcomes in patients with aortic dissection. These findings suggest that patient-specific factors and the quality of multidisciplinary management may be as critical as rapid diagnosis. Prompt recognition combined with effective, coordinated treatment may improve prognosis in this high-risk patient population.

Keywords: Aortic dissection, emergency department presentation, diagnostic delay, in-hospital mortality, clinical outcomes

INTRODUCTION

The aorta, the largest artery in the body, originates from the left ventricle of the heart and transports oxygenated blood to all tissues and organs through its branches. The aortic wall consists of three layers: the intima, media, and adventitia (1). Aortic dissection is an acute condition in which a tear in the inner lining of the aorta leads to a separation of the intimal and medial layers from the adventitia. According to the Stanford classification, a dissection involving the ascending aorta is defined as Type A, while a dissection involving only the descending aorta is referred to as Type B (1-3). The DeBakey classification categorizes aortic dissection into three types: Type I involves the ascending aorta, aortic arch, and descending aorta; Type II is limited to the

ascending aorta; and Type III involves only the descending aorta.

In the early years of cardiac surgery, aortic dissection had a high mortality rate. However, with advancements in diagnostic and therapeutic approaches, it has become a condition that can be managed with relatively lower mortality rates (4). There are three main treatment strategies: resection of the affected aortic segment followed by replacement with a Dacron graft; thoracic endovascular aortic repair (TEVAR) with stent graft implantation; and hybrid repair using a frozen elephant trunk (FET) prosthesis (4,5).

The most common symptom of aortic dissection is the sudden onset of severe, tearing chest and back pain. The pain typically begins at the site of the tear and may radiate over time (6). Other symptoms may include shortness of breath, syncope, blood pressure variations, tachycardia, inter-arm blood pressure discrepancies, hoarseness, diaphoresis, and fatigue (3). The global incidence of aortic dissection is estimated at 5 to 30 cases per million per year, with approximately 40% of cases resulting in death. In Türkiye, about 350 cases are reported annually. It is most commonly seen in individuals aged 60–80 years and is two to three times more prevalent in men than in women (7). These data highlight that aortic dissection is a rare but life-threatening condition requiring prompt diagnosis and intervention.

The aim of this study is to examine mortality rates and clinical outcomes in patients with aortic dissection, as well as to evaluate the importance of early diagnosis. The focus is on investigating the impact of the time interval between emergency department admission, diagnosis of dissection, and surgical intervention on patient outcomes.

MATERIALS AND METHODS

Study Design

This study is a retrospective observational study. Patients admitted between January 1, 2018, and January 1, 2025, were included. For the study, ethics committee approval was received from the Health Research Ethics Committee of Izmir Katip Çelebi University, dated 14.02.2025 and numbered 0064.

Study Population

The study included all patients over 18 years of age who presented to the emergency department with symptoms suggestive of aortic dissection—such as chest pain, dyspnea, back pain, or shoulder pain—and who were subsequently diagnosed with aortic dissection. Pregnant women, patients with traumatic presentations, those transferred from other institutions, patients with missing outcome data, and those with incomplete medical records were excluded. The patient selection process, including inclusion and exclusion criteria, is summarized in Figure 1.

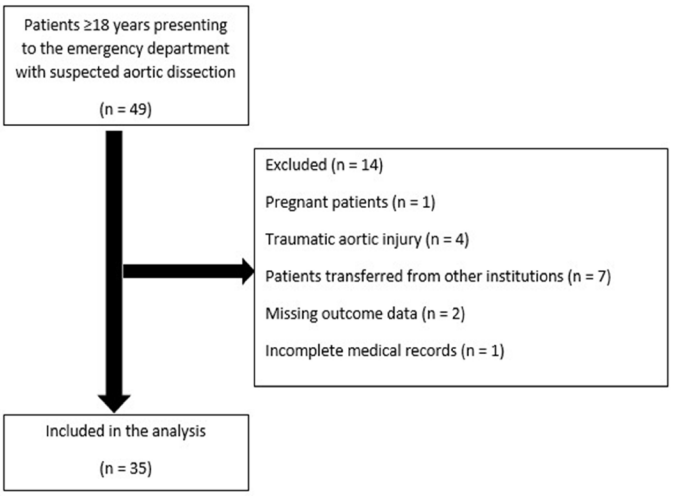

Figure 1. Flow chart of patient selection

Study Design Details

For all included patients, demographic characteristics such as age and sex were recorded. Time-related variables included emergency department admission time, time to computed tomography (CT) imaging, consultation time, and time to admission to a ward or intensive care unit.

Because the exact time of definitive diagnosis could not be consistently extracted from retrospective medical records, consultation time was used as a surrogate marker for diagnostic timing, reflecting the point at which aortic dissection was clinically suspected and specialty evaluation was initiated. Similarly, time to hospital admission was considered an indirect indicator of diagnostic and management progression. These variables were therefore used as proxies to evaluate the impact of diagnostic timing on clinical outcomes.

Outcome data and laboratory findings were retrieved from the hospital's electronic medical record system, and all data were transferred to a standardized data collection form for analysis.

Diagnostic Evaluation

The diagnosis of aortic dissection was established based on imaging findings. Contrast-enhanced computed tomography (CT) angiography was the primary diagnostic modality used in all patients. In selected cases, transthoracic echocardiography (TTE) was performed in 12 patients (34%), primarily due to hemodynamic instability and/or strong clinical suspicion of aortic pathology prior to definitive imaging. TTE was used as an adjunctive bedside tool to rapidly assess cardiac function and detect indirect signs of aortic pathology. All TTE-based impressions were subsequently confirmed by computed tomography angiography and/or operative findings, and no final diagnosis was established solely on the basis of TTE.The diagnosis was confirmed according to standard radiological criteria, including the presence of an intimal flap, true and false lumen differentiation, or evidence of intramural hematoma.

CT images were interpreted by experienced radiologists, and echocardiographic examinations were evaluated by emergency medicine specialists. In cases requiring surgical intervention, imaging findings were also reviewed by cardiovascular surgeons.

In our emergency department, patients presenting with clinical suspicion of aortic dissection undergo prompt clinical assessment followed by urgent contrast-enhanced CT imaging when feasible. Multidisciplinary consultation is initiated immediately after imaging confirmation.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics Standard Concurrent User V26 (IBM Corp., Armonk, New York, USA). Descriptive statistics were presented as frequency (n), percentage (%), mean±standard deviation ($\bar{x}$±SD), median (M), and minimum (min) and maximum (max) values. Mixed-design ANOVA was used to compare measurements across groups. For comparisons of main effects within the ANOVA models, Bonferroni correction was applied. A p-value <0.05 was considered statistically significant.

RESULTS

According to Table 1, the mean age of the study group was 67.83±14.01 years, with a median age of 68 years (range: 40–95). This finding indicates that the sample predominantly consisted of elderly individuals.

In terms of sex distribution, 40.0% of the participants were female (n=14) and 60.0% were male (n=21), suggesting a higher representation of male patients in the study population.

Regarding presenting complaints, chest pain was the most frequently reported symptom (40.0%), followed by other complaints (37.1%). Less frequently, patients presented with abdominal pain (8.6%), syncope (8.6%), and back pain (5.7%). This distribution highlights the clinical importance of chest pain as a key symptom in emergency department presentations for aortic dissection.

Concerning the need for emergency surgery, 54.3% of the patients (n=19) underwent surgical intervention, while 45.7% (n=16) did not. This indicates that nearly half of the patients presented with a clinical condition requiring surgical management.

Evaluation of emergency department outcomes revealed that the vast majority of patients (88.6%) were admitted to the intensive care unit, while 5.7% were discharged and 5.7% died in the emergency department. These data suggest that the patient group presented with severe clinical conditions requiring a high level of care.

Regarding in-hospital outcomes, 65.7% of patients were discharged, whereas 34.3% died during hospitalization. This indicates that the cohort had a high risk of mortality associated with aortic dissection.

Finally, the mean time from admission to consultation was 79.30±205.12 minutes, with a median of 16 minutes (range: 0–1143.78), and the mean time from admission to hospital or ICU admission was 104.93±200.72 minutes, with a median of 42 minutes (range: 6–1153.78).

Table 1. Demographic characteristics of patients

Variables	Statistics
Age	
$\bar{x}$±SD	67.83±14.01
M (min-max)	68 (40-95)
Gender, n (%)	
Female	14 (40.0)
Male	21 (60.0)
Presenting Complaint, n (%)	
Chest pain	14 (40.0)
Abdominal pain	3 (8.6)
Back pain	2 (5.7)
Syncope	3 (8.6)
Other	13 (37.1)
Emergency Operation, n (%)	
No	16 (45.7)
Yes	19 (54.3)
Emergency Department Outcome, n (%)	
Discharge	2 (5.7)
ICU Admission	31 (88.6)
Death	2 (5.7)
In-Hospital Outcome, n (%)	
Discharge	23 (65.7)
Death	12 (34.3)
Time from ED admission to consultation	
$\bar{x}$±SD	79.30±205.12
M (min-max)	16 (0-1143.78)
Time from ED admission to hospitalization/ICU admission	
$\bar{x}$±SD	104.93±200.72
M (min-max)	42 (6-1153.78)

$\bar{x}$: average, SD: standard deviation, M: median, ICU: intensive care unit

According to Table 2, the consultation-to-admission time was statistically similar between patients who underwent emergency surgery and those who did not. Likewise, the admission-to-presentation time did not show a statistically significant difference between the two groups.

Table 2. Intra-group and inter-group comparison

Temporal Difference	Emergency Operation		Test Statistics†	
	No	Yes	F	p
Time from ED admission to consultation	36.13±47.78	94.46±262.13	0.719	0.403
Time from ED admission to hospitalization/ICU admission	85.33±88.32	120.40±259.27	0.250	0.620
Test Statistics¥	F=22.509; ***p<0.001***	F=7.771; ***p=0.009***		

F: Mixed Design ANOVA, ¥ Comparison within groups, †Comparison between groups, Descriptive statistics are given as mean±standard deviation. Bolded sections are statistically significant (p<0.05)

However, within-group comparisons revealed that in patients who did not undergo emergency surgery, the time interval between admission and hospital admission was statistically greater than the time interval between admission and consultation. Similarly, in patients who underwent emergency surgery, the hospitalization time from admission was significantly longer than the consultation-to-admission time.

According to Table 3, comparisons based on emergency department outcomes revealed no statistically significant differences in consultation-to-admission time and hospitalization time from admission among the discharged, intensive care unit (ICU) admission, and deceased groups (p=0.985 and p=0.963, respectively). This finding suggests that the final outcome in the emergency department did not differ significantly with respect to the time elapsed following presentation.

However, within-group analysis showed that among patients who were admitted to the ICU, the time interval between admission and hospitalization was significantly longer than the interval between admission and consultation (F=23.953; p<0.001). This difference was not statistically significant in the other outcome groups.

According to Table 4, comparisons based on in-hospital outcomes (discharge or death) showed no statistically significant differences between the groups in terms of consultation-to-admission time and hospitalization time from admission (p=0.770 and p=0.840, respectively). This finding indicates that there was no significant difference in these time intervals between patients who were discharged and those who died during hospitalization.

However, when within-group analyses were considered, both the consultation-to-admission time (F=15.033; p<0.001) and the hospitalization time from admission (F=10.218; p=0.003) were found to be statistically significant. This suggests that, in both groups, the time taken to make a hospitalization decision was significantly longer than the time to consultation.

Table 3. Intra-group and inter-group comparison

Temporal Difference	Emergency Operation			Test Statistics†	
	Discharged	ICU Admission	Death	F	p
Time from ED admission to consultation	67.0±91.92	69.96±207.17	34.0±0.0	0.015	0.985
Time from ED admission to hospitalization/ICU admission	90.5±102.53	107.5±209.43	54.0±0.0	0.038	0.963
Test Statistics¥	F=0.605; p=0.442	***F=23.953; p<0.001***	F=0.219; p=0.643		

F: Mixed Design ANOVA, ¥Comparison within groups, †Comparison between groups, Descriptive statistics are given as mean±standard deviation. Bolded sections are statistically significant (p<0.05)

Table 4. Intra-group and inter-group comparison

Temporal Difference	Emergency Operation			Test Statistics†	
	Discharged	ICU Admission	Death	F	p
Time from ED admission to consultation	75.77±239.10	54.0±60.07	0.087	0.770	0.985
Time from ED admission to hospitalization/ICU admission	109.86±235.37	94.63±104.40	0.042	0.840	0.963
Test Statistics¥	***F=15.033; p<0.001***	***F=10.218; p=0.003***	F=0.219; p=0.643		

F: Mixed Design ANOVA, ¥ Comparison within groups, †Comparison between groups, Descriptive statistics are given as mean±standard deviation. Bolded sections are statistically significant (p<0.05)

DISCUSSION

This study aimed to evaluate the impact of the time interval between emergency department admission and diagnosis on patient outcomes in individuals diagnosed with aortic dissection. Our findings demonstrated that there was no statistically significant relationship between the durations from admission to diagnosis, consultation, or hospitalization and patient outcomes such as mortality or discharge.

The mean age in our study was 67.8 years, indicating a predominance of older individuals in the sample. This aligns with previous studies, which have shown that aortic dissection frequently occurs in the elderly population. The predominance of male patients is also consistent with literature identifying male sex as a known risk factor for aortic dissection (8,9).

Chest pain was the most commonly reported presenting symptom, which is consistent with the classic clinical presentation of aortic dissection. However, the presence of less specific symptoms such as abdominal pain, syncope, and back pain underscores the importance of considering a broad spectrum of clinical manifestations in the diagnostic process (10,11).

Temporal analyses revealed no significant association between either consultation or hospitalization times and patient outcomes. This suggests that prognosis is not determined solely by the time to diagnosis but is influenced by multiple factors such as dissection type, hemodynamic stability, comorbidities, and access to treatment. Although previous studies have emphasized that delays in surgical intervention, particularly in Type A dissections, can contribute to increased mortality, our study did not demonstrate this effect statistically. This discrepancy may be attributed not only to the influence of confounding factors such as surgical team performance, but also to methodological limitations including the relatively small sample size and the retrospective nature of the study.

The significantly longer time from admission to hospitalization observed in patients admitted to the intensive care unit suggests that these individuals required a more complex clinical management process. This finding supports the notion that factors such as advanced age, comorbidity burden, or the severity of the dissection influence patient management. A subset of patients who survive the initial phase of diagnosis may still require prolonged ICU stays and intensive treatment, which is not unexpected given the high mortality risk associated with aortic dissection.

When our time-related findings are interpreted in the context of the existing literature, they appear to be consistent with previously reported diagnostic and management patterns in aortic dissection. Current ESC guidelines emphasize the importance of rapid imaging-based diagnosis, particularly with contrast-enhanced computed tomography, to facilitate early risk stratification and management (1). However, both registry data and surgical series have demonstrated that variability in diagnostic and treatment timelines is common, even in experienced centers, due to differences in clinical presentation, disease severity, and institutional workflows (2,4,5). Studies focusing on Type A aortic dissection have highlighted that outcomes are strongly influenced by factors such as malperfusion, hemodynamic instability, and surgical complexity, rather than diagnostic timing alone (4–6). In this context, the consultation and hospitalization times observed in our cohort fall within the range reported in prior studies and suggest that our institutional diagnostic process is comparable to established clinical practice. These findings further support the notion that while timely diagnosis is essential, prognosis in aortic dissection is determined by a multifactorial interplay of patient- and disease-related factors rather than time metrics alone.

Although no significant association was observed between diagnostic timing and clinical outcomes in this study, these findings should be interpreted with caution. The relatively small sample size, retrospective design, and lack of adjustment for potential confounders—such as aortic dissection type (Stanford type A vs. B), comorbid conditions, and hemodynamic status—may have limited the ability to detect clinically meaningful differences. Therefore, the absence of a statistically significant association should not be interpreted as evidence of no effect. Rather, our results highlight the need for larger, multicenter prospective studies to better elucidate the impact of diagnostic timing on outcomes in patients with aortic dissection

This study has several limitations that should be acknowledged. First, the relatively small sample size may have limited the statistical power of the mixed-design ANOVA analyses, particularly for detecting small to moderate effect sizes. Therefore, the absence of a significant association between diagnostic timing and clinical outcomes may partly reflect a type II error. Given the rarity and high mortality of aortic dissection, larger multicenter prospective studies are needed to validate these findings and to better clarify the impact of diagnostic timing on patient outcomes. In addition, the single-center and retrospective design of the study may limit its external validity. Reliance on electronic medical records may also introduce inaccuracies in time-related data. Another important limitation is the absence of several well-established prognostic factors in aortic dissection, including dissection type (Stanford type A vs. B or DeBakey classification), hemodynamic stability at presentation, presence of malperfusion, and detailed imaging findings. The lack of these variables may have limited the interpretability of time-based comparisons and precluded comprehensive risk adjustment. Future studies incorporating these key clinical parameters are warranted to better clarify the relationship between diagnostic timing and patient outcomes.

CONCLUSION

This study investigated the impact of the time elapsed until diagnosis on patient outcomes in individuals diagnosed with aortic dissection in the emergency department. The data obtained indicated that the intervals between presentation and diagnosis,

consultation, and hospitalization were not directly associated with outcomes such as mortality or discharge. These findings suggest that prognosis cannot be explained solely by temporal factors; rather, it gains significance when considered in conjunction with variables such as dissection type, severity of clinical findings, comorbid conditions, and access to appropriate treatment.

Nonetheless, the potential life-saving value of early diagnosis and timely intervention in clinical scenarios with high mortality risk—such as aortic dissection—remains indisputable. Therefore, aortic dissection should be considered early in the differential diagnosis of patients presenting with chest pain or atypical symptoms, and diagnostic algorithms should be standardized accordingly. Future multicenter, prospective studies with larger sample sizes are needed to more clearly define the relationship between time to diagnosis and patient outcomes.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that there is no financial support.

Ethical Approval
The study protocol received approval from the Ethics Committee of Medical Researches, Izmir Katip Celebi University (Approval No: 0064, Date: 14.02.2025).

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