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Analysis of Contrast-Induced Nephropathy in Patient with Acute Myocardial Infarction Undergoing Percutaneous Coronary Intervention in the Emergency Department

Acil Serviste Akut Miyokard Enfarktüsü Tanısı Alıp Perkütan Koroner Girişim Uygulanan ve Kontrast Nefropati Gelişen Hastaların Analizi

Yeliz Şimşek¹, Selen Sürer Ada¹, Salim Satar¹, Yahya Kemal İcen²

ABSTRACT

Aim: The purpose of this study was to determine the incidence and predictors of Contrast-induced acute kidney injury (CI-AKI) in emergency patients undergoing primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI).

Material and Methods: We enrolled electrocardiogram (ECG) findings, serum creatinine (Cr), troponin, alanine aminotransferase (ALT), aspartate aminotransferase (AST) levels at pre-PCI and Cr levels post-PCI following three days. Patients' N-terminal pro-brain natriuretic peptide (NT-proBNP) levels, left ventricular ejection fraction (LVEF) and results of angiography was recorded in 422 patients. We analyzed the relationship between examined parameters and the occurrences of CI-AKI.

Results: CI-AKI occurred in 9.7% of patients. There was a statistically significant relationship between occurrences CI-AKI and age, gender, AST, ALT, creatinine levels at admission, cardiac dysfunction ($P<0.001$, $P<0.01$, $P<0.01$, $P<0.05$, $P<0.001$, $P<0.05$).

Conclusion: According to our study; age>70 years, abnormal pre-PCI creatinine, female gender, high basal AST-ALT levels, cardiac dysfunction may predict CI-AKI development in patients who undergoing PCI for treatment of AMI.

Keywords: Emergency, contrast nephropathy, percutaneous coronary intervention.

ÖZ

Amaç: Çalışmamızda, acil serviste akut miyokardiyal enfarktüs (AMI) tanısı alan ve perkütan koroner anjiyografi (PKA) uygulanan hastalarda, kontrast kaynaklı akut böbrek hasarının (CI-AKI) insidansını ve klinik prediktörlerini belirlemek amaçlandı.

Gereç ve Yöntemler: Çalışmamıza 422 hasta dâhil edildi. Hastaların, kan troponin, alanin aminotransferaz (ALT), aspartat aminotransferaz (AST) düzeyleri, başvuru sırasındaki ve PKA'dan üç gün sonraki serum kreatinin (Cr) düzeyleri, N-terminal pro-beyin natriüretik peptid (NT-proBNP) seviyeleri, elektrokardiyogram (EKG) bulguları, sol ventriküler ejeksiyon fraksiyonu (LVEF) ve anjiyografi sonuçlarını kaydettik. İncelenen parametreler ile CI-AKI oluşumları arasındaki ilişkiyi analiz ettik.

Bulgular: CI-AKI hastaların% 9.7'sinde görüldü. CI-AKI ile yaş, cinsiyet, AST, ALT, başvuru anındaki kreatinin düzeyleri, kardiyak disfonksiyon varlığı arasında istatistiksel olarak anlamlı bir ilişki vardı ($P <0.001$, $P <0.01$, $P <0.01$, $P <0.05$, $P <0.001$, $P <0.05$).

Sonuç: Çalışmamıza göre; Yaş> 70, anormal pre-PCA kreatinin, kadın cinsiyet, yüksek bazal AST-ALT seviyeleri, kardiyak disfonksiyon, AMI tedavisi için PKA uygulanan hastalarda CI-AKI gelişimini öngörebilir.

Anahtar Kelimeler: Acil, kontrast nefropati, perkütan koroner anjiyografi

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Introduction

Contrast-induced acute kidney injury (CI-AKI) is the sudden change in renal function following contrast medium administration. It occurs 1-3 days after the procedure and usually returns to normal within 7 days (1,2). CI-AKI incidence varies between 2% and 50% (3).

Emergency percutaneous coronary intervention (PCI) is the best treatment approach in the treatment of acute myocardial infarction (AMI) (4,5). PCI restores the circulation of coronary arteries and improves the survival of the patient by correcting the feeding of the myocardium. CI-AKI due to contrast agent used during the procedure is one of the major complications affecting the mortality and morbidity of the patient. The incidence of CI-AKI that develops after PCI varies between 2-20% (6). CI-AKI rarely requires dialysis (7). The risk of developing CI-AKI is higher in emergency PCI than elective (8-10).

Although many risk factors affecting the development of CI-AKI after PCI have been identified, the relationship between them has not been fully clarified (11). Determining the predicting parameters and risk factors for CI-AKI that may develop in patients with emergency PCI is important for prognosis. In our study, we evaluated the AMI patients who undergoing emergency PCI. The purpose of this study was to determine the incidence and predictors of CI-AKI in patients undergoing primary PCI for AMI.

Material and Methods

The patients who presented to Emergency Department (ED)- which has an annual turnover of 250.000 patients - between 1 January 2017 and 31 April 2019 were screened. We studied 18 aged and above patients who diagnosed with ST elevation myocardial infarction (STEMI) in ED and underwent PCI within the first hour. Our study was designed retrospectively. Patients with cirrhosis, chronic renal failure (CRF) requiring dialysis and anemia which hemoglobin values <10 g/dl (Reference value= 12.6-17.0 g/dl) were excluded from the study.

422 patients were included in the study. Demographic characteristics of the patients, electrocardiogram (ECG) findings, pre-PCI blood creatinine, troponin, alanine aminotransferase (ALT), aspartate aminotransferase (AST) and N-terminal pro-brain natriuretic peptide (NT-proBNP) values, vascular lesions which were detected in PCI and creatinine values of the first 3 days after PCI were recorded. The patients' age were divided into two groups as <70 age and over.

Lesions which were detected in PCI were grouped into left anterior descending artery (LAD), circumflex artery (Cx) and right coronary artery (RCA). Vessels with obstruction above 50% were evaluated as abnormal.

NT-proBNP or left ventricular ejection fraction (LVEF) was used to evaluate cardiac decompensation of patients. NT-proBNP > 2000 pg/ml (Reference value = 0-100 pg / ml) or LVEF <40% was considered abnormal.

CI-AKI was defined as 25% or 0.5 mg/dl increase from baseline Cr within 72 hours after PCI.

The relationship between CI-AKI development and the age, gender, ALT, AST, troponin, creatinine levels, cardiac dysfunction (decision based on NT-proBNP or LVEF) of the patients were analyzed by chi-square method.

The statistical analysis of our data was performed using the "SPSS for Windows Version 16.0" software. $P < 0.05$ was considered statistically significant.

The ethical approval of the study was gotten from the local ethical committee with the approval number 12.08.2020/1034

Results

422 patients who were diagnosed as STEMI in the ED and undergoing PCI were included in our study. 308 (73%) of the patients were male and 114 (27%) were female.

The patients' age is minimum 29, maximum 92 and the mean age was 60.14 +/-12.5. According to the ECG findings in the ED, 228 (54%) of the patients were anterior, 169 (40%) were inferior, 14 (3.32%) were posterior and 11 (2.6%) were lateral STEMI. Laboratory parameter results of the patients are summarized in Table 1.

The maximum measured ALT level was 611 U/L, the mean value was 22.25 +/- 49.08 U/L (Reference value: 0-34 U/L). The maximum measured AST level was 800 U/L, the mean value was 66.46 +/-121.74 U/L (Reference value: 0-35 U/L). The maximum measured creatinine level of the patients at the time of admission was 4.8 mg/dl (Reference value: 0.66-1.09 mg/dl). The maximum measured creatinine level after PCI was 7.6 mg/dl. The development of acute renal failure requiring hemodialysis after PCI was seen in only 2 (0.47%) patients. Pre-procedure creatinine levels were high in these two patients.

CI-AKI occurred in 35(9.7%) patients. There was a statistically significant relationship between CI-AKI and gender, pre-PCI creatinine level, basal AST, ALT levels ($P < 0.01$, $P < 0.001$, $P < 0.01$, $P < 0.05$). When the age of the patients was divided into two groups <70 and above, a statistically significant difference was found between the two groups in terms of development of CI-AKI ($P < 0.001$).

There was no statistically relationship between troponin elevation and CI-AKI ($P = 0.555$).

No statistical relationship was found between CI-AKI and the diagnosis of the patients according to ECG findings ($P = 0.704$). Cx, LAD and RCA lesions were evaluated in angiography of the patients. Accordingly, 200 (47.4%) patients had one vessel, 126 (29.9%) had 2 vessels, 90 (21.3%) had 3 vessels with more than 50% obstructive

Laboratory Parameters (Normal Value)	Number of Patients with normal value	Number of patient with abnormal value	Total number of patients
Alanine aminotransferase (0-34 U/L)	365 (86.5%)	57 (13.5%)	422 (100%)
Aspartate aminotransferase (0-35 U/L)	285 (67.5%)	137 (32.5%)	422 (100%)
Troponin	127 (30.1%)	295 (69.9%)	422 (100%)
Pre-PCI creatinine (0.66-1.09 mg/dl)	352 (83.4%)	70 (16.6%)	422 (100%)
Post-PCI creatinine	320 (75.8%)	102 (24.4%)	422 (100%)

Table 1. Laboratory Parameters of Patients

lesions. 6 (1.4%) patients had normal angiography. There was no statistically significant relationship between CI-AKI and the presence of lesions in the angiography or the number of lesional vessels ($P=0.460$, $P=0.289$).

303 patients with NT-proBNP or LVEF were enrolled. 90 (21.3%) had high NT-proBNP or LVEF <40%. There was statistically significant relationship between CI-AKI and cardiac dysfunction ($P < 0.05$).

Discussion

CI-AKI is defined as renal dysfunction associated with the administration of contrast media, in the absence of any alternative etiology. For CI-AKI there are different definitions and different creatinine cut-off values in guidelines (6). In our study, CI-AKI was defined as 0.5 mg/dl or 25% in serum creatinine increase from pre-PCI creatinine level.

The incidence of CI-AKI after PCI is different in studies. In our study, incidence of CI-AKI independent of pre-procedure creatinine level was found 9.7%. Incidence of CI-AKI was found 13.1% in study of Mehran R. et al., 22.7% in study of Yuan Y. et al., 15.8% in study of Sun G. et al, and 19% in study of Marenzi G. et al (9,11-13). In study of Chong E et al., CI-AKI incidence was found 7.3% in patients who underwent emergency PCI after AMI with normal creatinine levels (10). In the study of Yuan hui Liu et al, the incidence of CI-AKI in patients with STEMI was found 9.2% (14). Many studies have been done to determine the risk factors for the development of CI-AKI in patients undergoing PCI. It was shown that there was a difference in the development of CI-AKI between the emergency and elective PCI (3). Age was found to be an important risk factor for CI-AKI (6,9,10,12,13). In our study, a significant relationship was found between advanced age and CI-AKI. In our study, the effect of gender on the development of CI-AKI was analyzed and a significant statistically differences was found in women. In study of Lucreziotti S et al., there was found that female gender increased the risk of CI-AKI after PCI in AMI (15).

Determination of basal creatinine value before the procedure may be useful in predicting the development of nephropathy. In study of Chalikias G. et al., the impaired renal function at baseline was found an independent risk factor for CI-AKI (6). Iakovou I. et al. studied 8628 patients who underwent PCI. In their study, pre-PCI chronic renal failure was found to be an independent predictor of CI-AKI (16). According to the study of Chong E. et al., the incidence of post-PCI contrast-induced nephropathy (CIN) development in patients with normal serum creatinine level was lower than in our study (10). The need of dialysis in patients with CI-AKI due to PCI is rare (6). In our study, the need of dialysis was <1%.

In our study, we did not find any statistical relationship between CI-AKI and ECG findings, the degree of obstruction in the vessels, the number of vessels with lesions. There was no difference in CI-AKI development between patients with normal and abnormal angiography. In study of Marenzi G., there was found correlation with CIN and anterior MI (9). In the study of Yuan Y. et al, stent application to LAD was considered to be an independent risk factor for CI-AKI (11). Recent data proved the effect of BNP for predicting CIN. Study of Yuan-hui Liu et al. showed that the best cut-off NT-proBNP value for detecting CIN was 1800 pg/mL with 69% sensitivity and 70.0% specificity (14). In study of Kurtul A. et al, there was found that NT-proBNP ≥ 2149 pg/mL measured on admission had a 79.4% sensitivity and 74.3% specificity in predicting CIN (17). In our study, NT-proBNP elevation or low LVEF were evaluated as cardiac dysfunction. According to our study; there was statistically significant relationship between cardiac dysfunction and CI-AKI.

Limitations

Our study is retrospective and is not multi-centered. Hemodynamic instability parameters such as hypotension could not be evaluated. The number of patients developing CI-AKI is low.

Conclusion

In the ED, CI-AKI should be kept in mind in the AMI patients who underwent PCI. Early recognition, definition of risk factors and preventative therapies for CI-AKI in the ED is paramount to the patient's survival.

Definition of risk factors is important for the prognosis of patients and identification of treatment strategies for CI-AKI. Causes or risk classifications of CI-AKI have not been clarified yet. According to our study; age > 70 years, abnormal pre-PCI creatinine, female gender, high basal AST-ALT levels, cardiac dysfunction (high NT-proBNP and/or low EF) may predict CI-AKI development in patients who undergoing PCI for treatment of AMI.

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Authors' Contribution: All authors contributed for conception, design of the study, data collection, data analysis, and assembly. The manuscript was written and approved by all authors.

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All authors declared that they follow the rules of Research and Publication Ethics.

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Assesment of the Knowledge and Skills of Paramedics Working in Prehospital Health Services on Making a Decision for and Applying Defibrillation and Cardioversion

Hastane Öncesi Acil Sağlık Hizmetlerinde Görev Yapan Paramediklerin Defibrilasyon, Kardiyoversiyon Uygulama Kararı Alma ve Uygulama Konusundaki Bilgi-Beceri Düzeylerinin Değerlendirilmesi

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ABSTRACT

Aim: The aim of the present study was to investigate the knowledge level and skills of paramedics working in prehospital 112 emergency medicine health services in the Konya province on making a decision for and applying defibrillation and cardioversion.

Material and Methods: Sixty-two paramedics working for the prehospital 112 emergency medicine health services in Konya province were included in this cross-sectional study. The data were collected through personal data form and the defibrillation and cardioversion application assessment observation form developed by the researcher.

Results: Of the paramedics, 90.3% were determined to have been diagnosed with ventricular fibrillation within the first 10 seconds and 90.4% were determined to have made a decision for defibrillation within the first 10 seconds. Of the paramedics, 58.1% were found to inquire regarding instability findings in patients who had ventricular tachycardia (VT) and whose pulses were palpable; 75.8% were found to have made a decision for applying cardioversion within the first 10 seconds, and 72% were found to activate the synchronous (SYNC) button. Differences were found in the selection of a proper energy value when the defibrillator electrodes were on the defibrillator and enabling safety/ warning steps during defibrillation and cardioversion applications.

Conclusion: It was concluded that paramedics are successful in recognizing rhythm, making a decision for defibrillation and cardioversion, and that simulation training improved the skills. On the other hand, the participants were seen to have insufficiencies at concurrent pulse and rhythm control, making a decision for starting cardio-pulmonary resuscitation, energy selection when the defibrillator electrodes were on the defibrillator and energy load when the defibrillator electrodes were on the patient, inquiring stability/instability findings, applying gel and enabling safety/warning during the cardioversion procedure.

Keywords: Paramedic, defibrillation, cardioversion, emergency medicine

ÖZ

Amaç: Bu araştırma Konya İli hastane öncesi 112 acil sağlık hizmetleri istasyonlarında görev yapan paramediklerin defibrilasyon, kardiyoversiyon uygulama kararı alma ve uygulama konusundaki bilgi- beceri düzeyini incelemek amacıyla yapılmıştır.

Gereç ve Yöntemler: Kesitsel tarama modeli ile yapılan araştırmaya Konya ili 112 acil sağlık hizmetlerinde görev yapan 62 paramedik dâhil edilmiştir. Verilerin toplanmasında araştırmacı tarafından oluşturulmuş kişisel bilgi formu, defibrilasyon ve kardiyoversiyon uygulama değerlendirme gözlem formu kullanılmıştır.

Bulgular: Paramediklerin %90,3'ünün ventriküler fibrilasyon ritmini 10 saniye içerisinde tanıdığı, %90,4'ünün ilk 10 saniyede defibrilasyon uygulama kararı aldığı saptanmıştır. Paramediklerin %58,1'inin monitörde ventriküler taşikardi ritminin gözlemlendiği ve nabız alınabilen hastada unstabilite bulgularını sorguladıkları, %75,8'inin ilk 10 saniyede kardiyoversiyon uygulama kararı aldığı, %72'sinin senkron (SYNC) tuşunu aktif hale getirdiği saptanmıştır. Defibrilasyon ve kardiyoversiyon uygulamalarında defibrilatör elektrotları defibrilatör üzerindeyken uygun enerji seçimi ve güvenliğin sağlanması/uyarı basamaklarında farklılıklar saptanmıştır.

Sonuç: Araştırmadan elde edilen bulgular doğrultusunda paramediklerin ritim tanıma, defibrilasyon ve kardiyoversiyon uygulama kararı alma konusunda başarılı oldukları, simülasyon eğitimlerinin beceriyi artırdığı sonucuna varılmıştır. Defibrilasyon ve kardiyoversiyon uygulamalarında ritim ile eş zamanlı nabız kontrolü, kardiyopulmoner resüsitasyona başlama kararı, defibrilatör elektrotları defibrilatör üzerinde iken enerji seçimi ve defibrilatör elektrotları hasta üzerinde iken enerji yüklemesi; kardiyoversiyon uygulama sırasında stabil/unstabil bulguları sorgulama, jel sürme, ve güvenlik/uyarı sağlama basamaklarında eksiklikler olduğu görülmüştür.

Anahtar Kelimeler: Paramedik, defibrilasyon, kardiyoversiyon, acil tıp

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Introduction

Prehospital health services are high stress environments where decisions are made rapidly and sometimes with little knowledge and making a rapid diagnosis for critical patients is of vital importance for initiating an effective treatment. Hence, it is very important that the healthcare professionals who work in prehospital emergency services have the skills to make rapid decisions and apply proper interventions.

The first rhythm being ventricular fibrillation (VF) in sudden cardiac arrests (SCA) observed outside the hospital and not initiating treatment reduce the survival (1,2,3). Defibrillation is the most effective treatment method for ventricular fibrillation (VF), pulseless monomorphic or polymorphic ventricular tachycardia (VT) (4,5). Cardio-pulmonary resuscitation (CPR), which is applied in prehospital SCA in the presence of two or more rescuers, prolongs the VF, delays the onset of asystole and widens the time window where defibrillation may develop. Therefore, the necessity of initiating CPR by one rescuer while another is controlling the rhythm and preparing for defibrillation has been emphasized (6,7,8). Synchronous cardioversion is indicated for arrhythmias that are unstable and lead to hemodynamic disorders. The shock in synchronous cardioversion is applied concurrently with the R wave in QRS complex on electrocardiography (ECG) (9,10,11). High quality defibrillation and cardioversion applied in a timely, proper manner improve the survival (7).

The aim of the present study was to investigate the knowledge level and skills of paramedics whose duties, authorities and responsibilities had been defined in 2004 and who are working for the 112 emergency service ambulances, on deciding upon and applying defibrillation and cardioversion, and thereby to make a contribution to the literature.

Material and Methods

The study universe was composed of 136 paramedics who were working at the 112 emergency medicine ambulances in the Konya province between January and March 2017 in this cross-sectional study. Exclusion criteria were added for the study. Employees who are associate degree graduated from the first and emergency aid program but works as emergency medical technicians are not included in the study. The individuals who would be included in the sample were determined with random sampling with the stratified sampling method and 62 paramedics were included in the study by targeting to reach at least one person from each unit.

The personal data form, cardioversion and defibrillation application-evaluation observation forms, which included a coding system, were used for the data collection. The observation results were evaluated by the researcher during application of the scenarios prepared by the researcher and recorded on the data collection forms.

Approval was obtained from the ethics committee and the institution where the study was conducted (70632468-050.01.04/17283). Paramedics who participated in the study were informed about the research in their unit. Informed consent was read to the paramedics and verbal consent was obtained. So, they participated in the study as volunteers. The fact that the researcher was an observer was explained to the participants prior to the study. The participants were informed about the interventions to be applied by the researcher before and during the study, but not about the assessment criteria and patient characteristics. For making it closer to reality, adult ambu branded model compatible with defibrillation and cardioversion, LeardalHeartSim CPR simulator and primedic monophasic defibrillator were used for the interventions (defibrillation, cardioversion, etc.) that could be harmful when applied directly on the patient in the study.

Statistical analyses were carried out using the SPSS 21.0 (Statistical Package for Social Sciences). While the descriptive statistics of the paramedics were given as frequency and percent, the Phi/Cramer's V coefficient was used for determination of the power of the associations detected in the analyses of the significant parameters according to the chi-square test. A p level of <0.05 was accepted as statistically significant.

Results

The demographic data, educational status and the experience level of the participants have been presented in Table 1.

According to the defibrillation application and assessment form, more than half of the participants were detected not to do pulse control concurrently with the rhythm (58.1%), not to make a decision for starting CPR before defibrillation (58.1%); they were found to be successful in the selection of a proper energy level (79.1%); however, they did not make energy selection when the defibrillator electrodes were on the device for a safe defibrillation (56.5%). The participants who did not make a decision for defibrillation (3.2%) and who did not take off the clothes of the patient (19.4%) were directed by the researcher for continuation of the scenario (Table 2).

Of the participants, more than 70% were found to recognize VT within the first 10 seconds (88.7%), control carotid artery pulse concurrently with the rhythm (88.5%), make a decision for cardioversion within the first 10 seconds (75.8%), take off the clothes of the patient and perform preparation for the cardioversion step (85.5%), make SYNC button active (72.6%), place defibrillator electrodes on the proper site (85.5%), apply pressure onto the defibrillator electrodes (71%), perform a successful discharge procedure (98.4%) and evaluate pulses following cardioversion (80.6%). The participants who did not make a decision for cardioversion (11%) and who did not prepare the patient for cardioversion

Variables	Number (n)	Percentage (%)
Gender		
Female	36	58.1
Male	26	41.9
Age		
21-25 years	23	37.1
26-30 years	23	37.1
31 years and above	16	25.8
Education status		
Associate degree	52	83.9
Graduate and post-graduate degree	10	16.1
Marital status		
Married	31	50.0
Single	31	50.0
Profession seniority		
0-5 years	27	43.5
6-10 years	27	43.5
10 years and above	8	13.0
The unit where he/she works		
Center	30	48.4
County	32	51.6
Status of attending adult life support training		
No	3	4.8
In 2014 and before	35	56.5
In 2015 or after	24	38.7
Status of attending adult simulation training		
No	41	66.1
Yes	21	33.9
Total	62	100.0

Table 1. Distribution of socio-demographic variables, education and experience

by taking off the clothes (14.5%) were directed by the researcher for continuation of the scenario (Table 3).

Energy selection when the defibrillator electrodes are on the defibrillator for defibrillation differs from the energy selection when the defibrillator electrodes are on the defibrillator for cardioversion ($X^2=36.342$; $p=0.000<0.05$). The categorical association values were determined to be $\Phi=0.766$; Cramer's $V=0.766$; Contingency Coefficient= 0.608 and a high directly proportional association was determined (Table 4).

Enabling safety for defibrillation/warning differs from enabling safety for cardioversion/warning ($X^2=22.940$; $p=0.000<0.05$). The categorical association values were found to be $\Phi=0.608$; Cramer's $V=0.608$; Contingency

Variables	Number (n)	Percentage (%)
Recognizing VF rhythm		
No	6	9.7
Yes (within 10 seconds)	56	90.3
Concurrent pulse and rhythm control with		
No	36	58.1
Yes- Others	1	1.6
Yes- Carotid Artery	25	40.3
Making a decision for CPR until defibrillator device is ready		
No	26	58.1
Yes	36	41.9
Making a decision for defibrillation		
No	2	3.2
Yes- (20 seconds and above)	2	3.2
Yes- (11-20 seconds)	2	3.2
Yes- (Within 0-10 seconds)	56	90.4
Taking the clothes off at defibrillation application area		
No	12	19.4
Yes	50	80.6
Applying gel onto defibrillation application area		
No	11	17.7
Yes- Incorrect	11	17.7
Yes- Correct	40	64.6
Selecting energy when defibrillator electrodes are on the device		
No- Incorrect joule	12	19.3
No- Correct joule	35	56.5
Yes- Incorrect joule	1	1.6
Yes- Correct joule	14	22.6
Placement of defibrillator electrodes		
Incorrect	12	19.4
Correct	50	80.6
Energy loading on defibrillator electrodes		
Other	31	50
On the patient	31	50
Applying pressure on defibrillator electrodes		
No	23	37.1
Yes	39	62.9
Safety/ Warning		
No	26	41.9
Yes	36	58.1
Successful discharge procedure		
Yes	62	100
Making a decision for CPR 2 minutes following defibrillation		
No	5	8.1
Yes	57	91.9

Table 2. Statistical analysis of making a decision for and applying defibrillation

Coefficient= 0.520 and a more than moderate directly proportional association was determined (Table 5).

Discussion

The gradual increase in cardio-vascular diseases-related mortality and morbidity, VF being the first observed rhythm at the time of arrest and defibrillation being the most effective treatment for VF reveal the importance of recognizing the rhythm (12). In a study evaluating the paramedic students who receive advanced cardiac life support (ACLS) training, more than half of them were seen to fail in the questions about rhythm (13). In another study investigating the attitudes and behaviors of paramedics and emergency medicine technicians on ECG, the vast majority of the students answered the questions about ECG rhythms,

Variables	Number (n)	Percentage (%)
Recognizing VT rhythm		
No	5	8.1
Yes (10 seconds above)	2	3.2
Yes (within 10 seconds)	55	88.7
Concurrent pulse and rhythm control with		
No	8	12.9
Yes- Others	1	1.6
Yes- Carotid Artery	53	85.5
Inquiring stability/ instability finding		
No	26	58.1
Yes	36	41.9
Making a decision for cardioversion		
No	7	11.3
Yes- (11-15 seconds)	8	12.9
Yes- (Within 0-10 seconds)	47	75.8
Taking the clothes off at cardioversion application area		
No	9	14.5
Yes	53	85.5
Applying gel onto cardioversion application area		
No	31	50
Yes- Incorrect	5	8.1
Yes- Correct	26	41.9
Activation of SYNC button		
No	17	27.4
Yes	45	72.6
Selecting energy when defibrillator electrodes are on the device		
No- Incorrect joule	17	27.4
No- Correct joule	32	51.6
Yes- Incorrect joule	3	4.8
Yes- Correct joule	10	16.1
Placement of defibrillator electrodes		
Incorrect	9	14.5
Correct	53	85.5
Energy loading on defibrillator electrodes		
Other	20	32.3
On the patient	42	67.7
Applying pressure on defibrillator electrodes		
No	18	29
Yes	44	71
Safety/ Warning		
No	38	61.3
Yes	24	38.7
Successful discharge procedure		
No	1	1.6
Yes	61	98.4
Assessment of carotid artery pulse following cardioversion		
No	12	19.4
Yes	50	80.6

Table 3. Statistical analysis of making a decision for and applying cardioversion

mainly fatal rhythms including VF, correctly (14). In a study evaluating the knowledge level of the nurses working in emergency and intensive care units on ECG, the rate of recognizing VF increased following education (15). In a study investigating the knowledge level about resuscitation instructions in basic and advanced life support, 75.4% of the physicians and 54.9% of the nurses were seen to recognize the rhythms treatable with shock (16). In our study, the rate of recognizing emergency rhythms was quite high; however, the rate of controlling carotid artery

		Cardioversion				Total	X ²	p	Phi/ cramer's
		1	2	3	4				
D e f i b r i l l a t i o n	1	25(3)	66.7(8)	0(0)	1.9(1)	12	36.342	0.000	0.766
	2	34.3(12)	62.9(22)	0(0)	2.9(1)	35			
	3	0(0)	0(0)	0(0)	100(1)	1			
	4	14.3(2)	14.3(2)	21.4(3)	50(7)	14			
Total		27.4(17)	51.6(32)	4.8(3)	16.1(10)	62			

*(1) The defibrillator electrodes are not on the defibrillator- Incorrect joule
 *(2) The defibrillator electrodes are not on the defibrillator- Correct joule
 *(3) The defibrillator electrodes are on the defibrillator- Incorrect joule
 *(4) The defibrillator electrodes are on the defibrillator- Correct joule

Table 4. The association between energy selection and defibrillation-cardioversion

pulse concurrently was low due to having been focused on rhythm only and treatment after the patient lost consciousness. In a study evaluating the knowledge level and skills of the health professionals about basic life support and defibrillation, the participants were found to be successful at controlling carotid artery pulse and/or vital signs; however, the study did not evaluate the concurrent control of pulse and rhythm (17). In a study, 61% of the participants answered the question “What would your first intervention be in a patient who becomes unconscious and whose pulse cannot be palpated when being followed-up at the hospital?” as “I start cardiac massage.” (18). In our study, more than half of the participants did not make a decision for starting CPR before defibrillation. It is suggested that the participants skipped this step as they were alone when VF was diagnosed and started defibrillation, and they should state cardiac massage verbally, and thereby it is recommended to perform a similar study with a team of 3 members.

		Cardioversion			X ²	p	Phi/ cramer's v
		No	Yes	Total			
D e f i b r i l l a t i o n	No	96.2(25)	3.8(1)	26	22.94	0.000	0.608
	Yes	36.1(13)	63.9(23)	36			
	Total	61.3(38)	38.7(24)	62			

Table 5. The association between enabling safety/warning and defibrillation/cardioversion

Thirty minutes of delay in starting advanced cardiac life support (ACLS) or this duration exceeding 90 minutes together with transport time does not accord with life. Therefore, defibrillation is not only defined as a useful intervention, but it also adds 29 minutes of delay for reaching the hospital (19). In a study including 134 physicians working at different clinics and evaluating the resuscitation knowledge level in accordance with current guidelines, 67.2% of the participants were determined to apply defibrillation at the correct rhythm (20). In our study, almost all paramedics made a decision for defibrillation within the

first 10 seconds. Applying near-real scenarios on the model during in-service trainings is suggested to positively influence success.

Placing the electrodes on the body without applying gel leads to severe irritation and burns during defibrillation and cardioversion procedures (1). In our study, 17.7% of the participants were determined not to apply the gel on the application site and 17.7% were found to apply the gel on the defibrillator electrodes (incorrect). In a study, this step was found to be frequently skipped (18). It is suggested that the importance of gel use should be emphasized during in-service training for health professionals and patient safety. In our study, the paramedics were found to be successful in the selection of a proper energy level; however, more than half were determined to select energy after handling the defibrillator electrodes. In a study evaluating the outcomes of basic life support and defibrillation course at a university hospital, 96.2% of the participants were seen to select the proper energy for defibrillation and in another study, 50% of the physicians and 43.9% of the nurses were seen to be successful for energy selection (16,17). In our study, 37.1% of the paramedics were determined not to apply pressure on defibrillator electrodes during defibrillation. It is suggested that the numbers may not reflect the accurate result as the participants stated after the assessment that they had applied pressure; the study was observational, and an accurate depth measurement could not be made visually. In one study, the most important shortage in defibrillation applications was the models not being proper for defibrillation and thereby shock could not be applied through applying pressure onto the chest with defibrillator electrodes (17).

It was predicted that the insufficiency could be in the safety/warning step as the study was conducted in a safe field for the participants. Almost half of the paramedics were found not to give warning before defibrillation, supporting our prediction. All participants performed a successful discharge procedure on the model. In one study, 80.2% of the participants warned before discharge and 93.4% applied shock. However, the defibrillator spoons were placed over the patient during shock and therefore, a comparison could not be made with our study (17). In order to be able to observe the outcomes accurately and clearly, it is recommended to conduct a similar study in a crowded environment that requires safety measures (a safe area prepared by the researchers).

In our study, almost all participants were determined to recognize VT and control the pulse concurrently and to make a decision for cardioversion. Stability/instability findings should be questioned before cardioversion (4,21). In our study, more than half of the participants stated that the patient's being unconscious was sufficient for making a decision of instability and did not question the other

findings. The participants were found to be successful in the step of preparing the patient for cardioversion through taking off the clothes of the patient; however, half of them were determined not to apply gel on the application site. It is suggested to put emphasis on this issue in safe cardioversion steps. The SYNC button should be activated before each cardioversion. Of the participants, 72% were found to activate the SYNC button in our study.

In our study, more than half of the participants were found to select the proper energy for cardioversion; however, they were found to be insufficient in the step of selecting the proper energy when the defibrillator electrodes were on the defibrillator for cardioversion. More than half of the participants were seen to perform energy loading when the defibrillator electrodes were on the patient, and to apply pressure to the defibrillator electrodes for the cardioversion procedure; however, they were found to be insufficient in the stimulus applying step. Almost all participants were determined to place the defibrillator electrodes at the proper site, and to perform a successful discharge and pulse assessment following cardioversion.

Energy selection when the spoons were on the defibrillator was more successful in the defibrillation procedure compared to cardioversion; however, the most similar behaviour was joule use. There were differences between defibrillation and the cardioversion procedures with regard to providing safety/warning and the most similar behaviors were observed in not ensuring safety. More attention should be paid at this step, particularly during the cardioversion procedure.

Limitations

The present study is the first which observationally evaluates defibrillation and cardioversion procedures through near-real scenarios and the data were limited to paramedics who worked in the Konya province.

Conclusion

It was concluded that paramedics are successful in recognizing rhythm, making a decision for defibrillation and cardioversion, and that simulation training improved the skills. On the other hand, the participants were seen to have insufficiencies at concurrent pulse and rhythm control, making a decision for starting CPR, energy selection when the defibrillator electrodes were on the defibrillator and energy load when the defibrillator electrodes were on the patient, inquiring stability/instability findings, applying gel and enabling safety/warning during the cardioversion procedure.

A certain loss in recalling the skills and in practice performance is inevitable due to time. Therefore, it may be recommended to generalize simulation trainings, making

Defibrillation and Cardioversion in Prehospital Health Services evaluations, not only for theoretical knowledge, but also for skills, and paramedics to follow updated guidelines.

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Authors' Contribution: All authors contributed for conception, design of the study, data collection, data analysis, and assembly. The manuscript was written and approved by all authors.

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Unscheduled Revisits within 24 Hours to the Pediatric Emergency Department: A First Single-Center Prospective Study in Turkey

Çocuk Acil Servise 24 Saat İçerisinde Yapılan Tekrar Başvurular: Türkiye'de Yapılmış İlk Prospektif Çalışma

Muhammed Ali Ekşi¹, Deniz Tekin¹

ABSTRACT

Aim: The evaluation of the patients who revisit the emergency department is used as one of the quality indicators of the emergency services. Revisits contribute to the increase in the emergency crowd, cause medical and legal problems. In our study, we aimed to determine the demographic and clinical features, revisit rates, and medical, institutional, or individual risk factors of patients who revisited Ankara University Hospital Child Emergency Department in the early period.

Material and Methods: 622 patients who revisited the pediatric emergency department with the same or related symptoms within 24 hours were included.

Results: The revisit rate was 0.54%. The age ranges of 252 (40.5%) patients were in 0-2 years. The complaints were 266(42.8%) fever, 114 (18.3%) were vomiting, 99 (15.9%) wheezing-cough, and 52 (8.4%) abdominal pain. The reasons for a revisit were increased or continued complaints in 453 (72.8%), new complaint in 115 (18.5%), not being fully informed by doctors in 31 (5%), treatment-related complications in 12 (1.9%), not taking the prescribed treatment in 11 (1.8%) patients. The twenty one (3.4%) of the patients were hospitalized, 156 (25.1%) were taken into observation, recommended treatment were changed in 97 (15.6%), additional examinations were made in 126 (20.3%) and the same recommendations were repeated in 194 (31.2%) patients. The recommended treatment was changed by additional examinations in 28 (4.5%) of the patients. It was determined that 6 (28.5%) had appendicitis and 6 (28.5%) had pneumonia in hospitalized patients and 5 (83%) of the patients hospitalized for pneumonia were under 1 year of age.

Conclusion: The patients with a history of hospitalization and chronic diseases were hospitalized more often and We think that it is necessary to carefully evaluate upper respiratory tract infections and abdominal pain complaints in young children and to plan a close control examination when necessary.

Keywords: Revisit, pediatric emergency medicine, emergency medical services utilization

Öz

Amaç: Acil servise tekrar başvuran hastaların değerlendirilmesi, acil servis hizmetinin kalite göstergelerinden biri olarak kullanılmaktadır. Tekrar başvurular acil servis kalabalığını artırarak kalabalığın yol açtığı tüm sorunlara katkıda bulunmakta ve hasta ile doktorlar açısından tıbbi ve hukuki sorunlara neden olmaktadır. Çalışmamızın amacı; Ankara Üniversitesi Hastanesi Çocuk Acil Servisi'ne erken dönemde tekrar başvuran hastaların demografik ve klinik özelliklerini, tekrar başvuru oranlarını ve hastaların tıbbi, kurumsal veya bireysel risk faktörlerini belirlemektir.

Gereç ve Yöntemler: Çalışmamıza çocuk acil servise 24 saat içerisinde aynı veya ilişkili semptom ile tekrar başvuran 622 hasta dahil edildi.

Bulgular: Tekrar başvuru oranı % 0,54 olarak saptandı. Tekrar başvuran hastaların 252 (%40,5)'si 0-2 yaş aralığındaydı. Başvuru şikayetlerinin 266 (%42,8)'sinin ateş, 114 (%18,3)'ünün kusma, 99 (%15,9)'unun hırıltı-öksürük, 52 (%8,4)'sinin karın ağrısı olduğu saptandı. Hastaların tekrar başvuru sebepleri incelendiğinde 453 (%72,8)'ünün şikayetlerinin artması veya devam etmesi, 115 (%18,5)'inin yeni bir şikayeti olması, 31 (%5)'inin doktorun aileyi tam olarak bilgilendirmemiş olması, 12 (% 1,9)'sinin tedaviye bağlı yan etki, 11 (%1,8)'inin ise reçete edilen tedaviyi almaması nedeniyle tekrar başvurduğu saptandı. Hastaların tekrar başvuru sonuçlarına bakıldığında hastaların 21 (%3,4)'inin hastaneye yatırıldığı, 156 (% 25,1)'sinin müşahadeye alındığı, 97 (%15,6)'sinin ilacının değiştirildiği, 126 (% 20,3)'sına ek tetkik yapıldığı, 194 (%31,2)'üne aynı önerilerin tekrarlandığı, 28 (% 4,5)'ine ek tetkik yapılarak ilacının değiştirildiği saptandı. Hastaneye yatırılan hastalara bakıldığında 6 (%28,5)'sinin apandisit, 6 (%28,5)'sinin pnömoni olduğu saptandı. Pnömoni nedeni ile yatırılan hastaların 5 (%83)'i 1 yaşından küçüktü.

Sonuç: Tekrar başvuran hastalardan başvuru öncesi hastane yatış öyküsü ve kronik hastalığı olanların daha fazla hastaneye yatırıldığı saptandı. Bir yaş altı çocuklarda özellikle üst solunum yolu enfeksiyonlarının ve tüm çocukluk döneminde karın ağrısı şikayetlerinin dikkatle değerlendirilmesi ve gerektiğinde yakın kontrol muayenesinin planlanması gerektiğini düşünmekteyiz

Anahtar Kelimeler: Tekrar başvuru, çocuk acil servisi, acil servisi kullanımı

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Introduction

The rapid increase of Emergency Department (ED) visits is a common problem in most countries (1). The function of the ED includes the assessment of presenting patients and the determination of the need for inpatient care or outpatient treatment and follow-up (2). Application within 48-72 hours after the first visit to the ED is considered as "revisit"(3). There are studies in the literature ranging from 24 hours to 6 months (6). In children, the frequency of revisit within the first 24 hours has been reported to be 1.79%, and the reasons for revisits were generally relied on shortcomings due to hospital or healthcare providers (7).

Evaluation of patients who revisit the ED in the early period is used as one of the quality indicators of the ED (4). When patients return within a short time after being evaluated in the ED with the same complaint, it is generally thought that their initial evaluation and treatment are inadequate (5). Reducing unplanned revisits to the ED will help to decrease the number of repetitive patients and reduce the workload of the emergency staff, decrease the medical expenses, provide better quality emergency care to the patients, increase patient satisfaction and reduce the legal problems of the doctors (8, 9).

This study aims to determine our ED's revisit rates to and evaluate the demographic and clinical characteristics of patients who revisit within the first 24 hours and investigate the medical, institutional, or individual risk factors of these patients. The reason why considered such a precipitated time was to investigate urgent revisits that possibly represent a serious deficiency of emergency health care.

Material and Methods

This prospective study was conducted in Ankara University Faculty of Medicine, Children's Hospital, Pediatric Emergency Department (PED) between March 01, 2018, to February 28, 2019, to investigate the patients who revisited our PED. Our hospital is a Tertiary Care Pediatric hospital with 12 bed-capacity. Our PED provides care for approximately 115.000 patient visits per year. Each patient visit is recorded in a computerized database.

During the year, patients who were younger than 18 years old and revisited to the PED with the same or related complaint were included in our study. The data recording form of the patients who met the study criteria was filled. Patients who gave informed consent to participate in the study were asked an open-ended manner questionnaire. Patients who revisited with a complaint that is unrelated to their first visit, who left the PED with their request at their first revisit were excluded. Informed consent was obtained from all patients.

Patients data form includes the age, the time and complaint at the first visit, history of hospitalization, the revisiting reason, revisiting time, managements of revisit, the distance of the patient's home from the hospital, the way of hospital admission, the socioeconomic and education levels of the

parents. Those who earn less than 2000 Turkish liras per month were considered to have a low socioeconomic level. Those whose monthly earnings were between 2000-5000 Turkish liras were considered to have a medium socioeconomic level. Those whose monthly earnings were more than 5000 Turkish liras were considered to have a high socioeconomic level. The study was carried out with the approval of the responsible Ethics Committee (12.11.2018 /18-1182-18) in accordance with National Law and the Helsinki Declaration from 1975 (in its current revised form).

Statistical Analysis

Statistical evaluation was performed with IBM SPSS 22 (SPSS Inc., Chicago, IL, USA) package program. Numerical variables with normal distribution mean \pm standard deviation, median (minimum-maximum) numerical variables without frequency, and categorical variables (percentages). To evaluate the differences between the two groups; Student's t-test is used when it meets the parametric test prerequisites and the Mann-Whitney U test is used when it does not. The relationship between the two variables was evaluated with the Pearson correlation. If not normally distributed, the Spearman correlation was selected. Relationships between categorical variables were analyzed with Fisher's Exact Test and Chi-Square test. $p < 0.05$ and $p < 0.01$ levels were considered statistically significant.

Results

There was a total of 114.216 visits to the PED during the one-year study period. A total of 752 (0.66%) of these returned to PED within 24 hours. Ninety-five patients who came for control examination and 35 patients who applied with unrelated complaints with their first visit were excluded. The evaluated number of revisits was 622 and the revisit rate was 0.54% (Figure 1).

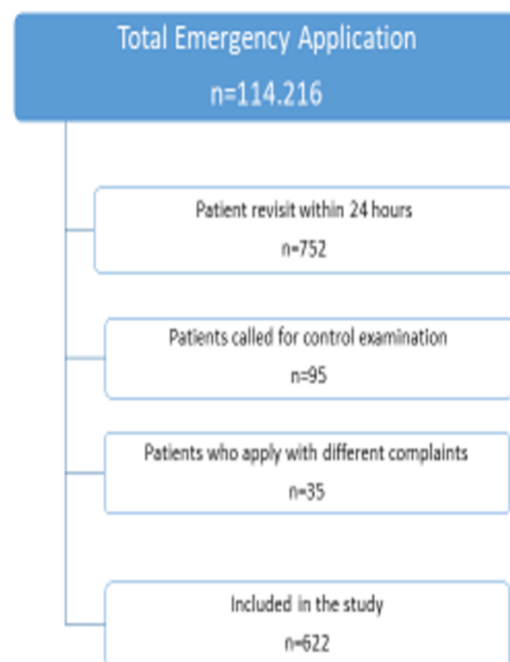


Figure 1. The flow-chart of the study

Almost half of the patients (40.5%) were younger than two-years-old. Most of the patients; 420 (67.5%) had a moderate socio-economic level. Four hundred thirty-three of patients (69.9%) revisits time were 16:01-24:00. Two hundred sixty-six (42.8%) of patient's presenting complaints were fever. Four hundred eighty-three (72.8%) of patient's reasons for revisits were increased or continued complaints. One hundred ninety-four (31.2%) of patients revisit results there the same recommendations given.

The demographic data of the patients, seasonal distribution, application hours, application complaints, reasons for revisiting and revisit results are shown in Table 1.

Chronic disease was present in 16.1% of patients. The most common chronic disease was asthma (32%). Five hundred and one (80.5%) did not apply to any Primary Health Care Institution before revisit.

The rate of observation to patients with chronic diseases was statistically significantly higher than those without chronic diseases ($p < 0.001$). No significant difference was found in other variables (Table 2).

The rate of observation in patients with hospitalization history was statistically higher ($p < 0.001$). No significant difference was found in other variables (Table 3).

The most common diagnoses were appendicitis and pneumonia. The diagnoses of the patients after revisits are shown in the table (Table 4).

Most of the patients who were hospitalized with pneumonia were under the age of one, and all were diagnosed as upper respiratory tract infections at the first application.

Discussion

To know the characteristics of patients who are likely to revisit the ED, is very important because of the higher mortality and morbidity rates of patients who revisit (10). We determined the causes of revisits and what was done to patients as a result of a revisit.

Several studies indicate that the '72-hour revisit rate' and also cause and results (11). However, the cause and results of 24 hours revisit are unclear. It is clear that return visits within 24 hours of discharge are not a suitable outcome of an ED visit as they may contribute to overcrowding of the ED and could serve as an indicator of the quality of care in the ED (12). The first 24 hours revisit was evaluated by only a single study examining revisits to the PED (7). The present study was therefore conducted to determine the cause and results of return visits within 24 hours.

In our study revisit rate was 0.54%. Since most of the revisit studies are revisits performed in the first 72 hours, the rate of revisit was found to be higher in some studies. The inclusion of patients who revisit only in the first 24 hours may explain the low rate of a revisit. Although the revisit rate was low in our study, it was noteworthy that 501 (80.5%) of

the patients did not apply to the Primary Health Care Institution. Each return visit to ED of the patient is associated with various deficiencies either of the hospital, health providers, or patient.

The studies have shown that the risk of revisit is higher in the first 2 years of age (8). Our data obtained that two hundred fifty-two (40.5%) of the revisit patients were in the 0-2 age range.

Goldman and his friends also found that the most frequent revisits were between 16:01-24:00 (2). In our study, 52 (8.4%) patients applied between 00:01-08:00, 137 (22%) patients applied between 08:01-16:00 and 433 (69.6%) patients applied between 16:01-24:00. This period is when emergency services are at their peak. The emergency crowd reduces the clinical evaluation quality of the patients and increases the risk of a revisit. Therefore, increasing the number and quality of physicians in periods when the number of patients increases may decrease the rate of a revisit.

In our study, the same recommendations were repeated for 194 (31.2%) of the patients who revisit and also we think the fact that the risk groups could not be predicted in the first evaluation shows that both the information and the quality of the examination were adversely affected. Also, It was reported that the reasons for a revisit to the PED were for continuity of complaints and not for the satisfaction of the family about their children's care in several studies (13, 14). In our study 453 (72.8%) of the patients revisit due to increased or continued complaints.

Fever, vomiting, abdominal pain, and upper respiratory tract infection were reported to be the most common complaints of presenting (15). In this study, most of the patients have complained of fever (42.8%), vomiting had the second-highest rate (18.3%), followed by wheezing-cough (15.9%), lastly abdominal pain (8.4%).

Studies reported that the most common diagnoses of patients hospitalized after revisit are respiratory tract diseases, abdominal diseases, urinary tract infections, and psychiatric disorders (10, 15). The diagnosis of patients who were hospitalized after revisit was appendicitis (28%) and pneumonia (28%) in our study. Five (83%) of the patients hospitalized for pneumonia were under 1 year of age. We suggest evaluating the children more carefully who are at and less than 1-year old. The other most common reason for hospitalization was appendicitis, abdominal pain is one of the most common reasons for admission to the ED, and acute appendicitis is one of the leading causes of malpractice (16). Also, appendicitis should be considered in every case of abdominal pain. Even if the abdominal examination was negative, the patient history should be evaluated carefully and to order radiologic imagine if necessary, to rule out appendicitis.

	Patient (n=622)	Percentage (%)
Age		
0-2 year	252	40.5
2-7 year	246	38.9
7-18 year	124	20.6
Socio-economic levels		
Low	50	8.5
Moderate	420	67.5
High	152	24.5
Seasonal distribution		
Spring	124	20
Summer	164	26
Autumn	156	25
Winter	178	29
Time of revisits		
00:01-08:00	52	8.4
08:01-16:00	137	22
16:01-24:00	433	69.6
Presenting complaints		
Fever	266	42.8
Vomiting	114	18.3
Wheezing-cough	99	15.9
Abdominal Pain	52	8.4
Rash	16	2.6
Restlessness	12	1.9
Reason for revisits		
Increased or continued complaints	453	72.8
New complaints	115	18.5
Inadequate information was given by the doctor	31	5
Treatment-related side effects	12	1.9
Unreceived prescribed treatment	11	1.8
Revisit results		
Same recommendations were given	194	31.2
Taken into observation room	156	25.1
Additional examinations were performed	126	20.3
Medications were changed	97	15.6
The drug was changed by additional examination	28	4.5
Patients were admitted to the hospitalized	21	3.4

Table 1. Demographic, descriptive, and clinical characteristics of the patients

Revisits results	Presence of chronic disease, (n, %)	
	Yes	No
Patients were admitted to the hospitalized	6 (6)	15 (2.9)
Taken into observation room*	38 (38)	118 (22.6)
Medications were changed	14 (14)	83 (15.9)
Additional examinations were performed	13 (13)	113 (21.6)
Same recommendations were given	21 (21)	173 (33.1)
The drug was changed by additional examination	8 (8)	20 (3.8)
Total	100 (100)	522 (100)

*This variable p<0.001

Table 2. Revisits results and presence of chronic disease

We found that the rates of hospitalization and observation of revisited patients are higher in those who have a hospitalization history or a concomitant chronic disease, which is similar to the study published by Akenroye et al. (4). The most common accompanying chronic disease was asthma 32 (32%). The reason for revisits of 49 (49%) of those with chronic disease was found to be related to their underlying disease. Studies have also found that asthma is the most common chronic disease in recurrent patients (17).

Revisits results	Hospitalization history (n, %)	
	Yes	No
Patients were admitted to the hospitalized	8 (7.2)	13 (2.5)
Taken into observation room*	50 (45)	106 (20.7)
Medications were changed	13 (11.7)	84 (16.4)
Additional examinations were performed	15 (13.5)	111 (21.7)
Same recommendations were given	16 (14.4)	178 (34.8)
The drug was changed by additional examination	9 (8.1)	19 (3.7)
Total	111 (100)	511 (100)

*This variable p<0.001

Table 3. Revisits results and hospitalization history

Limitations

This study has some limitations. First, it is a single-center study, and the second some of the revisited patients had applied to another hospital after the first evaluation. Furthermore, due to the lack of the same triage team, the triage status of the patients could not be examined.

Conclusion

Our study differs from other studies in terms of the present article is the prospective first report of return visits within 24

hours of discharge ED and examining primary care applications. In our study, the number of patients admitted to the third level emergency service without applying to the first step is so high which is the most important factor for cause crowded in ED. Using first step care centers more actively can reduce the number of revisits by reducing the ED crowd. Spending more time with patients in the emergency department and answering all the questions of

Diagnoses	Patients, n (%)
Appendicitis	6 (28)
Pneumonia	6 (28)
Febrile convulsion	2 (9)
Acute pyelonephritis	2 (9)
Acute gastroenteritis	1 (5)
Viral encephalitis	1 (5)
Aseptic meningitis	1 (5)
Lymphadenitis	1 (5)
Bronchiolitis	1 (5)

Table 4. The diagnosis of patients who were hospitalized after revisit

patients about diagnosis and treatment may reduce revisits. Being more careful in patients with chronic disease and a history of hospitalization may reduce morbidity and mortality.

Therefore, further studies involving multiple centers and greater sample size to clarify the effects of revisit reasons on the emergency crowd, as well as the negative consequences of the emergency crowd on information and the quality of the examination, are needed. So, further studies should aim to find possible solutions.

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Authors' Contribution: The authors confirm sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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All authors declared that they follow the rules of Research and Publication Ethics.

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Relationship Between Air Temperature and Urea, Creatin, EGFR, Sodium, Potassium Levels in Geriatric Patient Groups

Geriatrik Hasta Gruplarında Hava Sıcaklığı ile Üre, Kreatin, EGFR, Sodyum, Potasyum Düzeyleri Arasındaki İlişki

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ABSTRACT

Aim: In this study, we have aimed to investigate whether the changes in air temperature are related to electrolyte imbalance and renal dysfunction in geriatric patient population admitted to emergency departments.

Material and Methods: The study included 29,225 patients aged 65 and over, and these patients were divided into four groups based on the seasons. The patients were divided into 3 groups in terms of the age range in order to analyze whether the electrolyte imbalance would develop as a result of the increase in patients' ages.

Results: When the seasonal groups were compared in terms of urea, creatinine, and eGFR, urea and creatinine values were found to be statistically higher in summer when temperature values were high while sodium, potassium, and eGFR values were detected to be low ($p < 0.001$). Interpretation that the relationship between plasma sodium and seasons was statistically significant in the young-old, middle-old and oldest-old groups when it was evaluated according to the grouped ages (All $P < 0.001$). In the evaluation made on the basis of monthly temperature values, it was observed that the development rate of hyponatremia was at a higher level in July ($p < 0.001$).

Conclusions: In conclusion, we noticed in our study that electrolyte changes may occur due to temperature changes in the patients admitted to the emergency department.

Keywords: Seasonal temperatures effects, electrolyte imbalance, geriatric patient, emergency department

ÖZ

Amaç: Bu çalışmada acil servislere başvuran geriatrik hasta popülasyonunda hava sıcaklığındaki değişikliklerin elektrolit dengesizliği ve böbrek fonksiyon bozukluğu ile ilişkili olup olmadığını araştırmayı amaçladık.

Gereç ve Yöntemler: Çalışmaya 65 yaş ve üstü 29,225 hasta dahil edildi ve bu hastalar mevsimlere göre dört gruba ayrıldı. Hastaların yaşlarındaki artışa bağlı olarak elektrolit dengesizliğinin gelişip gelişmeyeceğini analiz etmek için hastalar yaş aralığı açısından 3 gruba ayrıldı.

Bulgular: Mevsimsel gruplar üre, kreatinin ve eGFR açısından karşılaştırıldığında, sıcaklık değerlerinin yüksek olduğu yaz aylarında üre ve kreatinin değerleri istatistiksel olarak daha yüksek, sodyum, potasyum ve eGFR değerlerinin düşük olduğu tespit edildi ($p < 0.001$). genç-yaşlı, orta-yaşlı ve en yaşlı-yaşlı gruplarında plazma sodyum ile mevsimler arasındaki ilişkinin gruplandırılmış yaşlara göre değerlendirildiğinde istatistiksel olarak anlamlı olduğu yorumu (Tüm $P < 0,001$). Aylık sıcaklık değerlerine göre yapılan değerlendirmede, hiponatremi gelişme hızının Temmuz ayında daha yüksek düzeyde olduğu görüldü ($p < 0,001$)

Sonuçlar: Sonuç olarak, çalışmamızda acil servise başvuran hastalarda sıcaklık değişimlerine bağlı olarak elektrolit değişikliklerinin oluşabileceğini fark ettik.

Anahtar Kelimeler: Mevsimsel sıcaklık etkileri, elektrolit dengesizliği, geriatrik hasta, acil servis

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Introduction

Emergency departments (ED), which have increasing importance in terms of providing medical service, play a significant role in the geriatric patient population receiving inpatient and outpatient treatment. The term "geriatric" has different definitions in the literature while the term "oldest" it was used for describing the people aged 85 and over in 1985. World Health Organization defined the people over the age of 60 as the elderly population. Although the patient group at and over the age of 65 is defined as the geriatric population in the Geriatric Emergency Service Manual published in 2014, it has been concluded that each hospital should determine the age of the geriatric patients to be treated in the Emergency Departments (1).

Geriatric patient population shows an increase all over the world, especially in developed countries. The problems that may occur in the elderly should be taken into consideration from physical, psychological and socioeconomic perspectives (2). It is known that electrolyte imbalance may occur at seasonally high temperatures due to fluid loss resulting from insufficient fluid consumption and perspiration and that deterioration may be observed in renal functions because of the activation of compensatory regulatory mechanisms (3). The risk of disease resulting from high seasonal temperature is more commonly observed in the elderly population, the patients having chronic diseases, disabled people and the individuals living alone (4,5). The studies have shown that the temperature changes have a direct impact on hospital admissions, morbidity and mortality (6).

It is observed that the air temperatures in our country and region have continued to increase over the years and more evidently in summers. In this study, we have aimed to investigate whether the changes in air temperature are related to electrolyte imbalance and renal dysfunction in geriatric patient population admitted to emergency departments.

Material and Methods

2.1. Study area and population

Diyarbakır, one of the biggest cities in the south-eastern region of Turkey, accommodates 1,699,901 inhabitants according to the records of the address-based population registration system taken by the Turkish Statistical Institute on December 31, 2017 (7). This study comprises the retrospective analysis of the patients presenting to the emergency department of Gazi Yaşargil Education and Research Hospital between 1 September 2016 and 1 September 2018. A total of 364,000 patients were admitted to the emergency department of our hospital in the above-mentioned time period. The study included 29,225 patients aged 65 and over, and these patients were divided into four groups based on the seasons: the patients admitted in spring were classified as group 1, the patients admitted in summer

as group 2, the patients admitted in autumn as group 3 and the patients admitted in winter as group 4. The patients were divided into 3 groups in terms of the age range in order to analyze whether the electrolyte imbalance that develop associated to the increase in patients' ages: group 1 was defined as the young-old (65-74 years), group 2 as middle-old (75-84 years) and group 3 as oldest-old (85 years and over).

2.2. Meteorological evaluation

Seasons were defined as follows: Spring (from March 1 to May 31), Summer (from June 1 to August 31), Autumn (from September 1 to November 30), and Winter (from December 1 to February 28). Daily minimum, maximum and mean temperature changes evaluated during the study period were obtained from the data recorded by the Directorate General of Meteorology of the Turkish Ministry of Agriculture and Forestry.

2.3. Exclusion criteria

The patients who were found to be diagnosed with chronic renal failure in the data processing system at the hospital and who were included in the routine dialysis program,, While examining the laboratory values of the patients, it was checked whether the patients whose glucose values were not within the normal reference values (70-105mg/dL) were diagnosed with diabetes in the hospital information processing system. Patients diagnosed with diabetes were excluded from the study. The patients under the age of 65 and the ones suffering from trauma were excluded from the study.

2.4. Data collection and measurements

We recorded serum urea, creatinine, sodium (Na), potassium (K) and Estimated Glomerular Filtration Rate (eGFR) values, sociodemographic data such as age and gender, and the highest daily air temperature at the time of admission of the patients included in the study based on the daily temperatures. We used the data defined according to the reference range of the central laboratory at our hospital. The normal reference range was determined as 16.6-48.5 mg/dl for the urea value, 0.7-1.2 mg/dl for the creatinine value, and $> 60 \text{ ml} / \text{min} / 1.73\text{m}^2$ for the eGFR value. The normal reference range was accepted as 3.5-5.1 mmol /L for potassium and 136-145 mmol/L for sodium in terms of dyskalemia and dysnatraemia rates. Hyponatremia was defined as a serum sodium value above 145 mmol/L while hyponatremia was explained as a serum sodium value below 136 mmol/L. The serum potassium values above 5.1 mmol/L were classified as hyperkalemia, and the values below 3.5 mmol / L were categorized as hypokalemia. The blood samples of the patients are taken through BD Vacutainer® SST™ II Advance Tubes (BD SST™ II Advance) blood collection tubes in our emergency department. Biochemical data are determined by means of a Cobas c 501 Automated Chemistry Analyzer (in Roche Hitachi Cobas C 501 System). The research protocol was reviewed and approved on 18.09.2018 with the assignment of number 139 by the Clinical Research Ethics Committee of Gazi Yaşargil Training and Research Hospital at the University of Health Sciences. The study was conducted according to the Declaration of Helsinki.

2.5. statistical methods

SPSS 25.0 (IBM Corporation, Armonk, New York, United States) program was used for the analysis of the variables. The conformity of the data to normal distribution was evaluated by means of Shapiro-Wilk test. One-Way ANOVA, a parametric method, was used for the comparison of independent multiple groups according to the quantitative data. Test Tukey HSD and Games-Howell tests were preferred for post hoc analysis while the Kruskal-Wallis H test was used with the results of Monte Carlo simulation technique and Dunn's Test was utilized for Post Hoc analysis. A partial Correlation test was used for the examination of the correlations among the variables after their year and day factors were taken under control. The comparison of the categorical variables was tested through Chi-Square Monte Carlo Simulation technique. The column ratios were compared with each other and they were registered according to the results of Benjamini-Hochberg corrected p values. Quantitative variables were shown as mean \pm SD (Standard Deviation) and median (Minimum) values in the tables while categorical variables were demonstrated with n (%). The variables were examined at 95% confidence level and the p values below 0.05 were accepted to be significant.

Results

29,225 patients were included in the study and they were defined according to the seasons. The patients in spring season were classified as group1 (n=7060), the ones in summer as group2 (n=7095), the patients in autumn as group3 (n = 6075), and the ones in winter as group4(n=8995). When we evaluated the groups in terms of increase and decrease in plasma sodium and potassium values according to seasonal changes, we found a statistically significant relationship between the conditions ($p < 0.001$). The development rate of hyponatremia was higher in summer (17,3%), than in spring (12,3%), autumn (14,3%) and winter (10,7%). While the rate of hypernatremia was higher in winter (15%) compared to summer (8,8%), which indicates a statistical significance in both cases ($p < 0.05$). Similarly, it was observed that the elevated level of potassium (Hyperpotassemia) was higher in winter (16.6%) than in summer (14.3%). When we compared the genders, age and age groups of the patients according to the seasons, we did not find a statistical significance (p ; 0.079, 0.065 and 0.172, respectively) Table 1.

When the seasonal groups were compared, urea and creatinine values were found to be statistically higher in summer when temperature values were high while sodium (Na), potassium (K), and eGFR values were detected to be low ($p < 0.001$). The measured values were in the normal reference range. Considering the whole patient population, patients presenting to the ED in summer months had slightly higher values of urea and creatinine and lower value of eGFR on the average in comparison with the patients admitted to the service in the winter season. Table 2 shows the median

values of urea, creatinine and eGFR and the averages of Sodium, Potassium and maximum temperature values according to seasonal temperature changes.

Spearman's rho correlation analysis was performed in order to assess whether there was a correlation between the change of daily temperature and urea, creatinine, sodium, potassium and eGFR values. When we evaluated the results, we found that there was a positive correlation between temperature changes and urea and creatinine while a negative correlation was detected between the aforesaid changes and sodium, potassium and eGFR levels. This correlation was recorded to be quite weak although there a statistical significance was observed ($p < 0.001$). Table 3 illustrates the correlation between the change of daily temperature at the time of admission and eGFR values, and urea, creatinine, Na and K values.

The relationship between the seasonal changes, plasma sodium and age groups are demonstrated in Table 4. When we examine the horizontal and vertical interpretations of this table, we see in the vertical interpretation that the relationship between plasma sodium and seasons was statistically significant in the young-old, middle-old and oldest-old groups when it was evaluated according to the grouped ages (All P values; < 0.001). The most obvious differences were examined in detail. Accordingly, the incidence of hypernatremia in the young, middle and oldest groups was at the highest level in winter months ($p < 0.05$), while hyponatremia was higher in the young-old, middle-old and oldest-old groups in summer ($p < 0.05$). When the relationship between plasma sodium and age were evaluated according to the seasons in horizontal interpretation, spring was not found to be statistically significant while a statistically significant relationship was detected in summer, autumn and winter seasons (P ; 0.253, 0.001, 0.003 and 0.003, respectively). The most obvious differences were examined in detail and hyponatremia was seen to be more common in young-old and middle-old groups in autumn ($p < 0.05$) while the incidence of hypernatremia was higher in middle-old and oldest-old groups in summer and winter months ($p < 0.05$).

The relationship between seasonal changes, serum potassium and age groups are given in Table 5. When we examine the horizontal and vertical interpretations of this table, we see in the vertical interpretation that the relationship between serum potassium and seasons was statistically significant in the middle-old group while it was not statistically significant in the young-old and oldest-old groups when this relationship was evaluated according to the grouped ages (P -values; 0.114, 0.062 and < 0.001 , respectively). The most obvious differences were examined in detail. Accordingly, the incidence of hyperpotassemia in the middle-old group was at the highest level in winter months ($p < 0.05$) whereas hypopotassemia was higher in

	Spring (A) (n=7060) Mean±SD	Summer (B) (n=7095) Mean±SD	Autumn (C) (n=6075) Mean±SD	Winter (D) (n=9885) Mean±SD	P
Age	76.11±7.37	76.21±7.52	75.88±7.39	76.15±7.41	0.065 ²
	n (%)	n (%)	n (%)	n (%)	
Gender					
Female	3958 (56.1)	3882 (54.7)	3404 (56.0)	5103 (56.7)	0.079 ¹
Male	3102 (43.9)	3213 (45.3)	2671 (44.0)	3892 (43.3)	
Age groups					
Young-Old	3254 (46.1)	3229 (45.5)	2899 (47.7)	4136 (46.0)	0.172 ¹
Middle-Old	2765 (39.2)	2757 (38.9)	2293 (37.7)	3501 (38.9)	
Oldest-Old	1041 (14.7)	1109 (15.6)	883 (14.5)	1358 (15.1)	
Plasma sodium					
Hypernatremia	541 (7.7)	624 (8.8) ^A	489 (8.0)	1353 (15.0) ^{ABC}	<0.001 ²
Hyponatremia	865 (12.3) ^D	1225 (17.3) ^{ACD}	870 (14.3) ^{AD}	962 (10.7)	
Normonatremia	5654 (80.1) ^{BCD}	5246 (73.9) ^{BD}	4716 (77.6)	6680 (74.3)	
Serum potassium					
Hyperpotasemia	1093 (15.5)	1017 (14.3)	954 (15.7)	1494 (16.6) ^B	<0.001 ²
Hypopotasemia	263 (3.7) ^D	312 (4.4) ^{CD}	196 (3.2)	271 (3.0)	
Normokalemia	5704 (80.8)	5766 (81.3)	4925 (81.1)	7230 (80.4)	

Table 1. Electrolyte changes by season, age groups, and gender

summer ($p < 0.05$). When the relationship between serum potassium and age were evaluated according to the seasons in horizontal interpretation, a statistically significant relationship was detected in spring, summer, autumn and winter seasons (P ; 0.004, <0.001, 0.022 and <0.001, respectively). The most obvious differences were examined

in detail and hyperpotasemia was seen to be at the highest rate in the oldest-old group in summer months and in middle-old and oldest-old groups in summer, autumn and winter months ($p < 0.05$) while hypopotasemia was not found to be significant according to the age groups ($p > 0.05$).

	Spring (A) (n=7060) Median (Min./Max.)	Summer (B) (n=7095) Median (Min./Max.)	Autumn (C) (n=6075) Median (Min./Max.)	Winter (D) (n=9885) Median (Min./Max.)	P
Urea (mg/dl)	43 (10 / 433)	45 (10 / 316)	44 (10 / 424)	42 (10 / 423)	<0.001 ⁵
Creatinine (mg/dl)	0.93 (0.24 / 4.97)	0.98 (0.21 / 4.98)	0.94 (0.26 / 7.74)	0.92 (0.03 / 7.76)	<0.001 ⁵
eGFR (CKD EPI) (ml/min/1.73m²)	77 (7 / 90)	67 (7 / 90)	73 (5 / 90)	70 (5 / 90)	<0.001 ⁵
	Mean±SD.	Mean±SD.	Mean±SD.	Mean±SD.	
Sodium (mmol/L)	140.04±4.54 ^{BCD}	139.64±5.46 ^D	139.76±4.78 ^D	140.72±4.87	<0.001 ^{2,3}
Potassium (mmol/L)	4.51±0.64 ^D	4.49±0.65 ^{CD}	4.53±0.63 ^D	4.56±0.63	<0.001 ^{2,4}
Maximum temperature °C	22.30±5.31 ^{BCD}	38.12±3.08 ^{CD}	25.12±8.30 ^D	10.05±4.02	<0.001 ^{2,3}

² OneWay ANOVA (Robusts Statistic: Brown-Forsythe); Post Hoc Test: ³ Games Howell, ⁴ Tukey HSD, ⁵ Kruskal Wallis Test (Monte Carlo); Post Hoc Test: Dunn's Test, SD: Standard Deviation, Min.: Minimum, Max.: Maximum

A Significant with respect to the spring season, B Significant with respect to the summer season, C Significant with respect to the autumn season, D Significant with respect to the winter season.

Table 2. Evaluation of the mean/median values of Urea, Creatinine, Sodium, Potassium, and eGFR by seasons

In the evaluation made on the basis of monthly temperature values, it was observed that the development rate of hyponatremia was at a higher level in July ($p < 0.001$) when the highest temperatures were recorded throughout the year (Mean±SD. 39.69±1.81 C⁰). It was seen that the rate of hyperpotasemia was higher in January when the coldest values were recorded in terms of mean temperature in the year (Mean±SD.9.44±3.14 C⁰) compared to other months (Anatolian J Emerg Med 2021;4(2):55-61

and that the development rate of hypopotasemia was higher in July when the highest temperatures were recorded (Mean±SD. 39.69±1.81 C⁰).

Discussion

As a result of the investigations we carried out in the planning phase of this study, we observed that there was limited evidence on the temperature changes and

	Maximum temperature degrees Celsius		Sodium		Potassium	
	r	P	r	P	r	PA
Sodium (mmol/L)	-0,101	<0.001	-	-	-	-
Potassium (mmol/L)	-0,034	<0.001	-0,074	<0.001	-	-
Urea (mg/dl)	0,024	<0.001	-0,047	<0.001	0,241	<0.001
Creatinine (mg/dl)	0,028	<0.001	-0,078	<0.001	0,221	<0.001
eGFR (CKD EPI) (ml/min/1.73m ²)	-0.029	<0.001	0,097	<0.001	-0,225	<0.001

Year and day effects of Partial Correlation Test have been kept under control, r: Correlation Coefficient

Table 3. spearman's rho correlation analysis

electrolyte imbalances in literature. Therefore, we believe that our study has provided significant results in terms of demonstrating the relationship between electrolyte imbalances due to seasonal temperature changes and renal dysfunction in the patients presenting to the emergency department in Diyarbakır, a city located in the southeastern region of Turkey where the continental climate is dominantly observed. It is a well-known fact that global warming has increasingly become an important cause of pathology over the years and that heat-related diseases affect many people every year. Diseases developing due to the increase in

temperature are of great importance since they may vary from the conditions that can be treated with simple medical interventions such as sunburn, redness, edema, syncope, and cramps to the potentially life-threatening forms such as heat stroke and heat exhaustion resulting from the deterioration of thermoregulation mechanisms. It is known that there is a linear decrease in glomerular filtration rate (GFR) at a rate of 8 ml/min/1.73 m²/year on average in most of the patients at and over the age of 40 with or without kidney disease (8).

Plasma sodium	Young-Old n (%)	Middle-O n (%)	Oldest-old n (%)	P (age * plasma sodium)
Spring				
Hypernatremia	233 (7.2)	212 (7.7)	96 (9.2)	0.253
Hyponatremia	395 (12.1) ^{II, III}	349 (12.6) ^{II, III, IV}	121 (11.6)	
Normonatremia	2626 (80.7) ^{II, III, IV}	2204 (79.7) ^{II, III, IV}	824 (79.2)	
Summer				
Hypernatremia	240 (7.4)	259 (9.4) ^A	125 (11.3) ^A	0.001
Hyponatremia	552 (17.1)	486 (17.6) ^{IV}	187 (16.9) ^{I, III, IV}	
Normonatremia	2437 (75.5) ^{BC}	2012 (73.0)	797 (71.9) ^{I, III}	
Autumn				
Hypernatremia	215 (7.4)	196 (8.5)	78 (8.8)	0.003
Hyponatremia	427 (14.7) ^C	350 (15.3) ^C	93 (10.5)	
Normonatremia	2257 (77.9)	1747 (76.2)	712 (80.6) ^B	
Winter				
Hypernatremia	558 (13.5) ^{I, II, III}	576 (16.5) ^{A, I, II, III}	219 (16.1) ^{A, I, II, III}	0.003
Hyponatremia	444 (10.7) ^{II, III}	364 (10.4) ^{III}	154 (11.3)	
Normonatremia	3134 (75.8) ^{BC}	2561 (73.2)	985 (72.5) ^{I, III}	
P (Seasons * Plasma sodium)	<0.001	<0.001	<0.001	

Pearson Chi-Square Test (Monte Carlo)

(A significant with respect to the young-old group, B significant with respect to the middle-old group, C significant with respect to the oldest-old group) when the relationship between plasma sodium and age was analyzed by being stratified according to seasons

(I significant with respect to spring group, II significant with respect to summer group, III significant with respect with autumn group, IV significant with respect to winter group) when the relationship between plasma sodium and seasons was stratified according to age.

Table 4. Relationship between plasma sodium and age groups according to seasonal changes

The studies in the literature have shown that the renal function and physiological changes in water and electrolyte homeostasis of elderly population may be mostly related to the mortality in elderly patients and that there is a decrease in renal tubular involvement of sodium and water in

dehydration periods of elderly patients (9). The physiological mechanisms of the body strive to regulate the electrolyte and water balance in the event of hyperthermia and dehydration. Renal failure may occur as the glomerular filtration rate decreases. Elderly people are more vulnerable

to the development of kidney disease related to increased heat due to decreased thermotolerance and weakened thirst (10). Studies conducted by Hansen et al. (11) have shown that the patients at or over the age of 85 constitute the highest risk group in terms of the electrolyte and renal dysfunctions, which may be the result of heat fluctuations, when compared to the patients at the age of 15-64. When we evaluated the increase and decrease in plasma sodium and potassium values due to seasonal temperature changes within the scope of our study, we found that the development rate of hyponatremia was higher in summer when the temperature values were high in terms of plasma sodium levels compared to winter and that the development rate of hypernatremia was at a higher level in winter, which indicates a statistical significance in both cases. Similarly, it was observed that the elevated level of potassium was higher in winter than in summer and these results were consistent with the literature. When the season groups were compared to each other in terms of urea, creatinine, and eGFR, urea and creatinine values were found to be statistically higher in summer when temperature values were high while sodium, potassium and eGFR values were calculated to be lower. Although this difference was statistically significant, no clinical significance was observed, and the measured values were in the normal reference range. This outcome was important for us since it demonstrated that the temperature increase could lead to electrolyte imbalance.

Malisova.O et al. (12) have illustrated in their study that the water demand is higher in summer months than in winter and that the loss of fluid due to sweating was about 1000 ml more in summer than in winter. Pfortmueller et al. (13) conducted a study in 2014 on the effect of excessive temperatures on the prevalence of electrolyte failure in the patients admitted to the ED, and they found out that the prevalence of hyponatremia was significantly elevated during the periods of high temperature and that there was a weak inverse correlation between daily maximum temperature changes and serum sodium and potassium. When we investigated whether there was a correlation between daily temperature changes and the values of urea, creatinine, eGFR, sodium, and potassium, we detected that there was a positive correlation between daily temperature changes and urea and creatinine levels and that the negative correlation between daily temperature changes and sodium, potassium and eGFR was statistically significant but very weak, which is compatible with the literature. We believe that this situation is caused by the increase in water and salt loss due to sweating at high temperatures, the decrease in fluid intake, and the inadequacy of regulatory mechanisms resulting from the increasing age. Older people have an increased risk of hyperkalemia, even in the absence of kidney disease. There are many factors contributing to this

situation, including a decrease in the levels of plasma renin and aldosterone and a decrease in the GFR due to increasing age. Studies have shown that plasma aldosterone levels are lower in healthy elderly individuals than in young individuals. Relative hypoaldosteronism may cause the development of hyperkalemia in response to the basal potassium value with increasing age. If other potassium regulatory systems fail, this may contribute to increased susceptibility to hyperkalemia (14). In a 10-year retrospective study carried out by Zhao et al. (15) in 2013, sodium levels were found to be significantly lower in August than in the rest of the year. In another study conducted by Mauro G. et al. (16), it was observed that the prevalence of hyponatremia increased in the elderly patients admitted to the ED and that there was an important increase in the prevalence of hyponatremia in the old group in summer months when compared to the adult group. In our study, it was observed that the development rate of hyponatremia was higher in July when the highest temperature values were recorded, as seen in the evaluation based on the monthly temperature rates. However, in January, when the coldest values were recorded in terms of average temperature in the year, the rate of hyperpotassemia was observed to be higher than in other months, and it was seen that the development rate of hypopotassemia was higher in July, when the temperature values were at the highest level than in other months. This outcome is compatible with the literature and it demonstrates how significant the temperature changes are in terms of sodium and potassium alterations. Many studies have illustrated that older individuals have a higher risk of morbidity and mortality due to temperature changes than the young population. On the other hand, it has been concluded that there is a need for further research on the field of high temperature-related extreme death rates in the elderly population that is increasing worldwide (17). In the study carried out by Katherine G. Arbutnott and Shakoob Hajat (18) in England on the impacts of temperature increases on the health under different climate change scenarios due to global warming in the future, it has been found out that hot summers and heat fluctuations had negative effects on health. By using different climate change scenarios, they have mentioned in all of the evaluations on heat-related effects that the temperature-related deaths would increase and that the increase in elderly population would contribute to the elevation of these rates, as seen in other studies.

In conclusion, we noticed in our study that electrolyte changes correlate with weather temperature changes in the patients admitted to the emergency department. For this reason, we aimed to draw the attention of the physicians to the high-temperature fluctuations in summer months due to the global warming and climate change, which have become increasingly important in recent years, and the heat-related

diseases that may develop because of this situation. We believe that it is necessary to take precautions and raise the awareness of the society in order to protect the individuals and especially the elderly patient group from long term exposure to heat during the summer months.

Limitations

Our research is a single-centered study. We could not perform the long-term follow-up of the patients since the study was carried out on the blood tests of the patients at the time of admission in the emergency department. Therefore, we cannot make an explanation of the growing mortality rate related to the weather temperature increase. We do not have a detailed history on how long the patients have been exposed to heat, what the rates of their daily fluid intake are, whether they use diuretics or another medication resulting in a fluid loss, and whether there is an air conditioning system in their houses.

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Authors' Contribution: The authors confirm sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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All authors declared that they follow the rules of Research and Publication Ethics.

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Vertigo and Presyncope: Clinical Presentation of Sinus Dysfunction

Vertigo ve Presenkop : Sinüs Disfonksiyonunun Klinik Görünümü

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ABSTRACT

Aim: Aim of this case presentation is to emphasize on the ECG recording of patients with history of drowsiness or presyncope.

Case: 87-year-old male was admitted to the emergency department (ED) with complaints of dizziness, light-headedness, and drowsiness. He had a history of coronary artery disease and he was being treated as per vertebrobasilar insufficiency because of symptoms. Atrioventricular nodal reentrant tachycardia (AVNRT) and right bundle branch block with bifascicular block was documented in the electrocardiography (ECG) records obtained in our ED. Following the treatment with diltiazem infusion, sinoatrial arrest-pause was captured during the monitorization in the ED. He was handed over to cardiology department for electrophysiologic (EP) study afterwards.

Discussion: Sinoatrial (SA) node dysfunction results from any pathology in impulse generation by pacemaker cells in the node or in conduction perinodal transmission cells. The etiologic factors leading to sinus node dysfunction are classified into two pathologies; first is the intrinsic pathology of the SA node, and second group is external causes that affect SA node. The most common intrinsic cause is the age-related fibrosis of the natural pacemaker cardiac tissue in the SA node. If the pause is longer than 3 seconds, the patient is a candidate for ablation therapy which depends on the result of the non-fluoroscopic electroanatomic mapping (CARTO) ablation technique.

Conclusion: Neurological symptoms such as drowsiness and presyncope may often manifest as a result of underlying cardiac pathology. ECG is a very useful tool for these patients if the records are taken at appropriate time.

Keywords: Drowsiness, presyncope, sinoatrial pause, sinoatrial node dysfunction, CARTO ablation

ÖZ

Amaç: Bu vaka sunumunun amacı, öyküsünde baş dönmesi veya presenkop olan hastalarda EKG kaydının önemine vurgu yapmaktır.

Olgu: 87 yaşında erkek hasta acil servise bayılma hissi, sersemlik ve baş dönmesi şikayetleriyle başvurdu. Hastada koroner arter hastalığı öyküsü vardı ve semptomları nedeniyle vertebrobaziler yetmezlik tedavisi almakta idi. Elektrokardiyografi (EKG) kayıtlarında acil servisimizde atriyoventriküler nodal reentran taşikardi ve bifasiküler blok ile birlikte sağ dal bloğu tespit edildi. Acil serviste diltiazem ile tedavi edilirken sinoatriyal pause gelişti. Daha sonra elektrofizyolojik çalışma ve yakın izlem için kardiyoloji bölümüne devredildi.

Tartışma: Sinoatriyal (SA) düğümde disfonksiyon, düğümdeki impuls üreten pacemaker hücrelerde veya perinodal iletide görevli hücrelerdeki patoloji sonucunda ortaya çıkar. Sinüs düğümü disfonksiyonuna yola açan etyolojik faktörler iki gruba ayrılır. İlki SA düğümün intrinsik patolojisi, ikinci grup SA düğümü etkileyen ekstrinsik patolojilerdir. En sık intrinsik neden yaşa bağlı olarak SA düğümdeki doğal pacemaker kardiyak dokuda gelişen fibrozistir. Eğer sinus pause 3 saniyeden uzun sürüyor ise hasta floroskopi kullanmadan uygulanan elektroanatomik haritalama sistemi (CARTO) ablasyon tekniği sonucuna bağlı olarak ablasyon tedavisine adaydır.

Sonuç: Hastalarda baş dönmesi, presenkop gibi nörolojik semptomlar altta yatan kardiyak patoloji sonucunda ortaya çıkabilir. Eğer kayıtlar uygun zamanda alınırsa EKG bu hastalar için çok faydalı bir araçtır.

Anahtar Kelimeler: Baş dönmesi, presenkop, sinoatriyal pause, sinoatriyal düğüm disfonksiyonu, CARTO ablasyon

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Introduction

In the United States, 20% of patients over the age of 60 who complained of dizziness had severe dizziness that interfered with their regular activities. Because symptoms are typically ambiguous and the differential diagnosis is broad, determining the cause of dizziness can be difficult. Tests based on the patient's medical history and physical examination might help narrow down the list of possible diagnoses. However, the underlying reason of this common symptom might range from psychological issues to life-threatening central nervous system disease (1).

Case Report

87 year old male was admitted to the ED with complaints of dizziness, light-headedness, and drowsiness. He was unable to stand up and prone to fall down if left unattended. He was suffering from headache started 10 days ago. He denied accompanying nausea, vomiting, or tinnitus. He had mild chest pain without palpitation. In his medical history he had prior coronary artery disease and had a percutaneous transluminal coronary angioplasty (PTCA) about 5 years ago. Before that intervention, he had suffered from dizziness and light-headedness; which had resolved in time. He had been using drugs for vertigo and vertebrobasilar insufficiency according to his medical prescription records.

At the time of the presentation to ED, his ECG was recorded as soon as he was presented. His vital signs were; blood pressure: 101/71 mm/Hg, heart rate: 160/min, irregular, fever: 36.4°C, O₂ saturation: 94%, Glasgow Coma Scale score: 15. His physical examination was completed and the only pathological sign was rapid heart rate at the auscultation. The remaining cardiovascular, respiratory, gastrointestinal, neurological, and peripheral examination showed no pathology. There was no specific pathological sign at the neurological examination. Neither nystagmus, nor ataxia, nor hearing loss was noted. The cranial CT was normal without any acute anomaly.

ECG (Figure 1) recording showed a rapid regular supraventricular rhythm with about 160 beats/minute. AVNRT was documented as well as right bundle branch block with bifascicular block. After the patient was given diltiazem 0.25 mg/kg intravenously (IV) in order to stabilize the rhythm, the patient had sinoatrial arrest-pause at the ECG which was documented only on the monitor (Figure 2). During that sinoatrial arrest-pause period, the patient felt dizzy again. Afterwards, the patient's rhythm strip revealed bradycardia-tachycardia syndrome, and AVNRT off-and-on (Figure 3). The patient was already consulted to the cardiology department for planning the work-up. Echocardiography (ECHO) was performed under emergency conditions by the cardiologist. ECHO was reported no kinetic disorder in the myocardial structures, no pericardial effusion, no regurgitation of the aortic and mitral valve, and,

no anomaly in the systolic function of the left ventricle. Amiodarone (1mg/kg) infusion was started in the ED and the patient was admitted to the Coronary Intensive Care Unit for close monitoring, and further therapeutic intervention. On admission, he was catheterized in the right femoral vein with two 6 F catheters and in right ventricle and coronary sinus with two 6 F EP catheters for EP study. EP study revealed no abnormality in terms of SA and atrioventricular (AV) node functions and associated aberrant conduction. Following 24 hours of monitorization without any need for further medical intervention, he was discharged after starting the drug regimen amiodarone 200 mg twice a day, amlodipine 5 mg once a day, acetyl salicylic acid 100 mg once a day, orally.

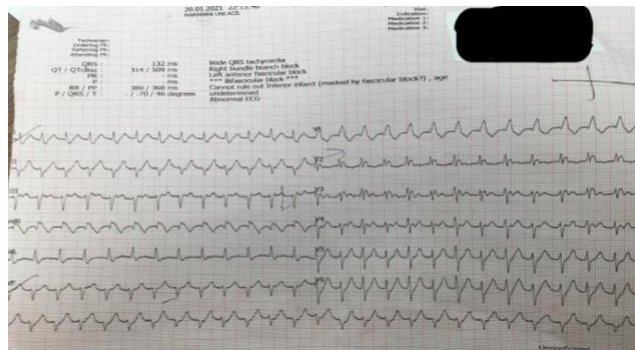


Figure 1. Initial ECG on admission

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Discussion

SA node dysfunction results from any pathology in impulse generation by pacemaker cells in the node or in conduction perinodal transmission cells. The transient abnormality of

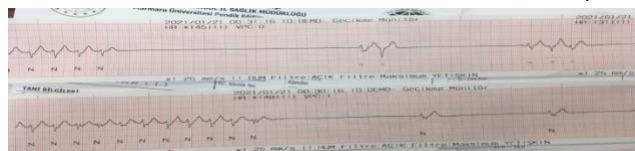


Figure 2. ECG strip following IV diltiazem administration

SA pacemaker is caused by an underlying disease or may occur in healthy individuals. Sinus pause association of atrial fibrillation is a sinus node dysfunction and it may be named as tachycardia-bradycardia syndrome (1). Medical interventions during tachycardia may result with prolonged pauses. If the pause is longer than 3 seconds, the patient is a candidate for ablation therapy which depends on the result of the CARTO ablation technique (2, 3).

Sinus pause often allows escape beats or rhythms to occur following the pause period. Longer episodes of sinus arrest can produce symptoms of dizziness, syncope, and even sudden cardiac death. The etiologic factors leading to sinus node dysfunction are classified into two pathologies; first is the intrinsic pathology of the SA node, and second group is external causes that affect SA node. The most common intrinsic cause is the age-related fibrosis of the natural

pacemaker cardiac tissue in the SA node. In addition; sinus node dysfunction may result from lasting arrhythmias, metabolic or congenital disorders, and surgery (4). The underlying cause sometimes is a mutation which offends the functioning of the ion channels; and it results with sick sinus syndrome. In animal models; it has been shown that long lasting heart failure with or without atrial tachyarrhythmias results in cellular remodeling of the sinus node. The systemic diseases such as collagen vascular diseases, sarcoidosis, amyloidosis, or even metastatic cancer result in the infiltration of SA node. After cardiac surgery for valve replacement, for correction of a structural heart disease or for heart transplantation, there might be secondary damages to SA node or the sinus nodal artery; this repair in turn may lead to SA node dysfunction. On the other hand, infections such as bacterial endocarditis, or viral myocarditis can often result in atrioventricular conduction problems rather than sinus node dysfunction. Since the SA node is located within the atrial wall, SA node is well protected against ischemic injury by atherosclerosis of the arteries feeding node; although SA node dysfunction is unusual, there are a few cases reported (5).

There are several external causes that can affect the normal function of the SA node. These conditions are majorly defined as the abnormally increased vagal tone with vasovagal syncope, or disfunction in the autonomic nervous system. The most common metabolic pathologies leading to SA pause are hypothermia, myxedema coma in hypothyroidism, hyper- or hypokalemia, hypocalcemia, and most significantly hypoxia of the patient due to any cause. Chronic obstructive pulmonary disease (COPD) and sleep apnea often may cause bradycardia with sinus pause because of the deep and profound hypoxia during episodes, especially during sleep (4, 6). Central nervous system lesions with increased intracranial pressure may induce Cushing's reflex which in turn may cause bradycardia with sinus pause. There are several pharmacologic and toxic agents which effects the SA node; these are commonly digoxin, class I to IV antiarrhythmic drugs, mad honey, herbal medications, lithium and other toxins with sympatholytic activity. The examples for toxic substances which create hypoxic conditions at the cellular level which lead to sinus pause are carbon monoxide poisoning or inhalation of chemical warfare gases (6).

CARTO ablation is an invasive technique used to treat patients with different arrhythmias. The mainstay of the technique is the mapping of the conduction system in the heart. CARTO stands for Cartographic information system. Conventional fluoroscopic catheter mapping has limited spatial resolution and has high risk for radiation exposure due to the fluoroscopy. The CARTO system is much safer, three dimensional and more precise in detection of the anomaly (7).

Conclusion

In the emergency departments, ECG monitoring with frequent ECG records of the patients with both cardiac history and neurological symptoms is a must. The fact that cardiac and neurological pathologies often accompany each other in elder patients should be kept in mind.



Figure 3. QR code for the video : On the monitor, bradycardia-tachycardia syndrome, and AVNRT off-and-on

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Informed Consent Statement: Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review in this journal.

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An Atypical Covid-19 Case; Spontaneous Subcutaneous Emphysema and Spontaneous Pneumomediastinum

Atipik Bir Covid-19 Olgusu; Spontan Subkutan Amfizem ve Spontan Pnömomediastinum

Agit Akgül¹, Sevilay Ünver¹, Tuğçe Nur Burnaz¹

ABSTRACT

Aim: Covid-19 pandemic is a new disease that shook the world. Its distinct clinical pictures that cannot be sharply limited may illuminate the pathogenesis of the disease and lead to new treatment studies. We aimed to present a Covid-19 patient with rare spontaneous pneumomediastinum and subcutaneous emphysema.

Case: A 40-year-old male patient was admitted to our hospital with respiratory distress. On his arrival he was cyanotic, confused, cold sweaty. Vital signs; blood pressure: 145/85 pulse: 142 respiratory rate: 40 fever: 37.8 unsupported oxygen saturation: 65. There was crepitation with palpation on both sides of the neck. In the computed tomography imaging of the patient; There were subcutaneous emphysema and pneumomediastinum accompanying peripherally located ground glass images. The patient whose respiratory distress persisted was intubated and taken to the intensive care unit. The patient who developed cardiopulmonary arrest on the second day of intensive care treatment was accepted as exitus.

Conclusion: Covid-19 also causes mortality in young patients. Covid-19 can contain different clinical pictures. Physicians working in the pandemic unit should be prepared for atypical applications; different examination findings should be kept in mind in terms of Covid-19.

Keywords: Covid-19, spontaneous subcutaneous emphysema, spontaneous pneumomediastinum

ÖZ

Amaç: Covid-19 pandemisi dünyayı sarsan yeni bir hastalıktır. Keskin sınırlanılmayan farklı klinik tabloları hastalığın patogenezi aydınlatmaya ve yeni tedavi çalışmalarına yol gösterebilir. Biz nadir rastlanan spontan pnömomediastinum ve subkutan amfizem mevcut olan bir Covid-19 hastasını sunmayı amaçladık.

Olgu: 40 yaşında erkek hasta solunum güçlüğü şikayetiyle hastanemize başvurdu. Gelişinde siyanoze, bilinci konfüze, soğuk terliydi. Vital bulguları; kan basıncı:145/85 nabız:142 solunum sayısı:40 ateş:37.8 desteksiz oksijen saturasyonu:65 şeklindeydi. Boyun her iki yanında palpasyonla krepatasyon mevcuttu. Hastanın bilgisayarlı tomografi görüntülemesinde; periferik yerleşimli buzlu cam görüntülerine eşlik eden subkutan amfizem ve pnömomediastinum mevcuttu. Solunum güçlüğü devam eden hasta entübe edilerek yoğun bakım birimine alındı. Yoğun bakım tedavisinin ikinci gününde kardiyopulmoner arrest gelişen hasta exitus kabul edildi.

Sonuç: Covid-19 genç hastalarda da mortaliteye sebep olmaktadır. Covid-19 farklı klinik tablolar içerebilmektedir. Pandemi biriminde görevli hekimler atipik başvurulara hazırlıklı olmalı; farklı muayene bulguları Covid-19 açısından akılda tutulmalıdır.

Anahtar Kelimeler: Covid-19, pnömomediastinum, subkutanöz amfizem

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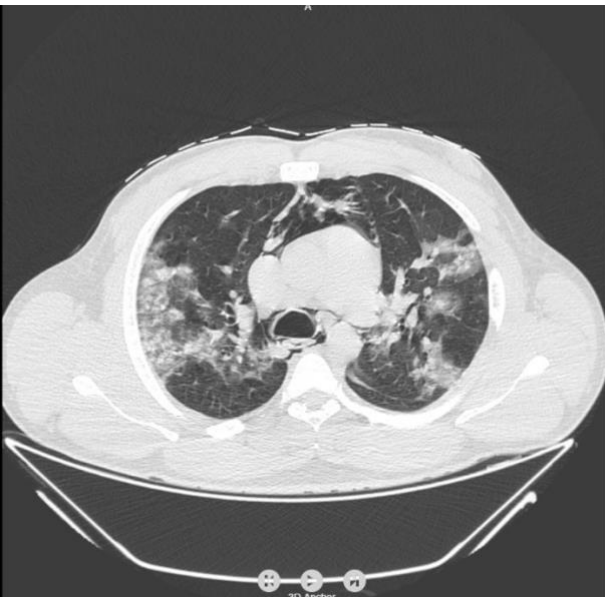
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Giriş

Günümüz klinisyenleri Covid-19 pandemisi ile savaşırken birçok yeni semptom ve klinik seyre tanıklık etmektedir. Biz vakamızda atipik klinik tablo ile başvuran bir covid-19 hastasını sunduk. Solunum yetmezliği ile ilişkili olarak hastalarda barotravmaya bağlı pnömomediastinum ve cilt altı amfizemleri görülmektedir. Pnömomediastinum ve cilt altı amfizemi nadir görülen bir klinik bulgudur (1). Spontan pnömomediastinum, künt travma veya mekanik ventilasyon gibi dış etkenler olmaksızın mediastende interstisyel hava bulunması olarak tanımlanır (2). Mekanizması; artan intratorasik basıncın terminal alveollerin yırtılması ve trakeobronşiyal ağaç boyunca havanın diseksiyonu ile sonuçlandığı Macklin etkisi ile açıklanabilir (3). Tetikleyici faktörler arasında astım, yoğun fiziksel aktivite ve valsalva manevraları (öksürme, hapsirme ve kusma) yer alır (4). Bu vakamızda covid-19 (+) hastamızın spontan pnömomediastinum ve spontan cilt altı amfizemleri eşlik etmektedir.

Olgu Sunumu

40 yaşında bilinen ek hastalığı olmayan erkek hasta ani başlayan solunum güçlüğü şikayeti ile acil pandemi polikliniğine 112 ekipleri tarafından getirildi. 6 gün önce dış merkeze öksürük ateş şikayeti ile başvuran hastadan pcr örneği alınıp izolasyon önerilerek taburcu edilmiş. 2 gün önce pcr + olan hasta artan nefes darlığı şikayeti ile acil servisimize başvurduğunda parmak ucu SaO₂ %65, Solunum sayısı 40/dk nabız:140 atım/dk Ta:144/85 mm/Hg GKS 15. Hastanın alınan anamnezinde travma geçirmediği öğrenildi. Hasta inspeksiyonda siyanozeydi. Boyun bölgesinde palpasyonda krepitasyonları mevcuttu. Maske desteğiyle oksijenasyonu sağlandıktan sonra oksijen desteği ile toraks bilgisayarlı tomografi çekildi. Toraks tomografisinde her iki akciğerde yaygın covidle uyumlu periferik yerleşimli infiltrasyonları mevcuttu (Figür 1).



Figür 1. Toraks BT'de infiltrasyon bulguları

Hastanın cilt altı amfizemleri ve pnömomediastinumunu dikkat çekmekteydi (Figür 2). Genel durumu kötü, desatüre ve takipneik olan hastanın entübasyonuna karar verildi. Yakın takip ve monitörizasyon amacıyla Covid yoğun bakıma interne edildi. Hastanın wbc:19.9 10³/uL(3.8-10) lym:% 5.3(10-48) neu % :90.3(45-78) crp:165.34 mg/L(0-5) ast:78 U/L (0-40) alt:85 U/L(0-41) ck:384 mg/dL kreatin:1.42 mg/dL(0,7-1,2) üre:49 mg/dL(16,6-48,5) d-dimer:980 ug/mL (<0,5) Yoğun bakım takiplerinde hastanın genel durumu kötü seyretti. Prone pozisyonda inotrop tedavi alan hastanın kan basıncı:70/30 mm/Hg, nabız:130 atım/dk, %100 FiO₂ altında parmak ucu Sao₂; 85. Hastaya favipiravir yükleme tedavisi ardından idame tedavisi uygulandı. Enfeksiyon hastalıkları önerisiyle uygun sistemik antibiyoterapi uygulandı. İmmun plazma istemi yapıldı. Hidrokortizon tedavisi başlandı. Hasta yoğun bakım takibinin 2. gününde kardiyopulmoner arrest sonrası eksitus kabul edildi. Hasta yakınlarından bu olgu sunumunun ve beraberindeki görüntülerin yayınlanması için yazılı bilgilendirilmiş onam alındı.



Figür 2. Toraks BT'de cilt altı amfizem ve pnömomediastinum bulgusu

Tartışma

Covid-19 enfeksiyonunun semptomları, büyük çalışmalarda karakterize edilmiştir, en sık görülenleri ateş, öksürük ve nefes darlığıdır (1). Hastalık ilerledikçe ortaya çıkabilmesine rağmen, pnömomediastinum ile prezentasyonu hala seyrekdir (4). Son çalışmalarda covid-19 hastalarında spontan pneumomediastinum görülmesi sık rapor edilmektedir. Pneumomediastinum mediastende hava bulunan nadir bir durumdur (2). Yoğun egzersiz, öksürük, kusma, enfeksiyon, astım gibi birincil akciğer hastalığı, interstisyel akciğer hastalığı ve inhalasyon tahriş edicileri (örneğin tütün ve yasadışı uyuşturucular) dahil olmak üzere çok çeşitli pneumomediastinum nedenleri tanımlanmıştır (5). Viral akciğer enfeksiyonları, SPM'nin nadir nedenleridir (6). Ancak SARS-CoV ve Orta Doğu solunum sendromu koronavirüsünün (MERS-CoV) alveolar duvarını oluşturan pnömositlerin pul pul dökülmesine neden olduğu gösterilmiştir (7). Alveollerin yırtılması ve ardından hava

kaçağı, pnömomediastene yol açan olası ilk olaydır. Genellikle erkekleri etkiler ve künt travma ya da yemek borusu zedelenmesi sonucunda oluşur (1). Aynı zamanda mekanik ventilasyon ve pozitif hava basıncı içeren barotravma sonucu gözüken bilindik bir komplikasyondur (1). Spontan gelişmesinde mekanizma, muhtemelen alveol ve pulmoner arasındaki artan basınç farkından dolayı alveolar duvarın yırtılmasından kaynaklanmasına rağmen tam olarak aydınlatılamamıştır (1). Pneumomediastinum'un Covid-19 vakalarında mekanik ventilasyondan bağımsız olduğu raporlanmıştır (1).

COVID-19 tedavisinde kullanılan birkaç yöntem klinik denemelerin bir parçası olmuştur. Araştırmalar hastanede kalan süreyi kısaltmak, sonuçları geliştirmek ve komplikasyonları azaltmak adına devam etmektedir. Mekanik ventilasyon uygulanmamış hastalarda bile pnömomediastinum görülebilmesi hastayı değerlendirirken düşünülmesi gereken farklı durumlar olabileceğini göstermektedir. Yaygın başvuru hali olan akciğerde periferik yerleşimli buzlu cam alanları, viral pnömoni tablosunun dışında; spontan pnömomediastinum ve subkütanöz amfizem de hastalığın fizyopatolojisi ve tanı-tedavi yaklaşımlarımızda odaklanabileceğimiz farklı noktalar olabileceğini düşündürmektedir. Daha fazla çalışma bu komplikasyonun patogenezi ve yaygınlığı açısından bir ihtiyaçtır.

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Aydınlatılmış Onam Formu: Hasta yakınlarından bu olgu sunumunun ve beraberindeki görüntülerin yayınlanması için yazılı bilgilendirilmiş onam alındı. Yazılı onamın bir kopyası dergide incelenmek üzere mevcuttur.

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Rare Case in Emergency Department; Mucormycosis Causes Vision Loss

Acil Serviste Nadir Olgu; Görme Kaybına Neden Olan Mukormikozis

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ABSTRACT

Aim: We aimed to present a case of rhinoorbital mucormycosis associated with high mortality and disability rates.

Case: A 46-year-old male patient with a history of diabetes was admitted to our emergency department with complaints of drooping of the eyelid and loss of vision. The patient with a necrotic lesion on the palate was hospitalized with the diagnosis of rhinoorbitocerebral mucormycosis.

Conclusion: In patients with a history of diabetes, periorbital cellulitis, loss of vision or neurological findings, mucor mokcosis should be kept in mind and the oropharynx should be examined thoroughly.

Keywords: Diabetes mellitus, rhino orbital cerebral mucormycosis, ocular manifestations, necrosis of the palate

ÖZ

Amaç: Yüksek mortalite ve sakatlık oranları ile ilişkili rinoorbital mukormikozis olgusunun sunulması amaçlandı.

Olgu: Diyabet öyküsü olan 46 yaşında erkek hasta göz kapağında düşme ve görme kaybı şikayeti ile acil servisimize başvurdu. Damakta nekrotik lezyonu olan hasta rinoorbitaserebral mukormikoz tanısı ile hastaneye yatırıldı.

Sonuç: Diyabet öyküsü olan, periorbital selülit, görme kaybı veya nörolojik bulgularla acil servise başvuran hastalarda mukor mikoziş akılda tutulmalı ve orofarinks iyice muayene edilmelidir.

Anahtar Kelimeler: Diyabetes mellitus, rinoorbital serebral mukormikoz, göz bulguları, damakta nekroz

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Giriş

Mukormikoz, mucorales türünden mantarlara bağlı gelişen mortalitesi yüksek bir mantar enfeksiyonudur (1,2). İnsidansı tam olarak bilinmemekle birlikte çok sayıda çalışma insidansının arttığını göstermiştir (1). Bir çok formu olup, en sık görüleni rinoserebral mukormikozistir (3). Rino-orbital-serebral invaziv mukormikoz, tipik olarak bağışıklığı baskılanmış ve özellikle hematolojik bozuklukları olan hastalarda ciddi ve yaşamı tehdit eden bir komplikasyondur (4). Diyabet özellikle diyabetik ketoasidoz (DKA) mukormikoz için önemli bir risk faktörü gibi görünmektedir (4). Diyabet öyküsü olan, göz çevresinde şişlik ve görme kaybı şikayeti ile acil servisimize başvuran ve rinoorbitaserebral mukormikoz tanısı konulan hastayı sunmayı amaçladık.

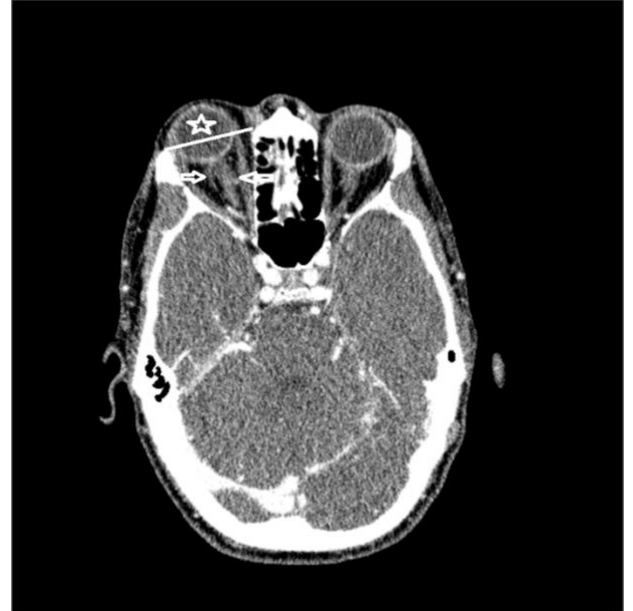
Olgu Sunumu

Diyabetes mellitus (DM) öyküsü olan 46 yaşında erkek hasta, sağ göz çevresinde şişlik ve görme kaybı şikayeti ile acil servisimize başvurdu. Hastanın 4 gün önce ağızda yara nedeniyle diş hekimine başvurduğu ve amoksisilin klavulanik asit tedavisi başlanıldığı, bir gün öncede bulantı kusma nedeniyle başvurduğu dış merkezde DKA tanısı aldığı ve DKA'ya yönelik tedavisinin uygulandığı, takipte göz çevresinde şişlik, göz kapağında düşme ve görmeye bulanıklık gelişmesi üzerine hastanemiz acil servisine yönlendirildiği öğrenildi. Bilinci açık koopere oryante olan hastanın sağ göz çevresinde şişlik, propitoz ve oftalmopleji izlendi. Sağ gözde ışık refleksleri ve kornea refleksi alınamayan hastanın, ağız içinde sert damakta orofarinkse kadar uzanım gösteren nekrotik lezyonu tespit edildi (Figür 1).



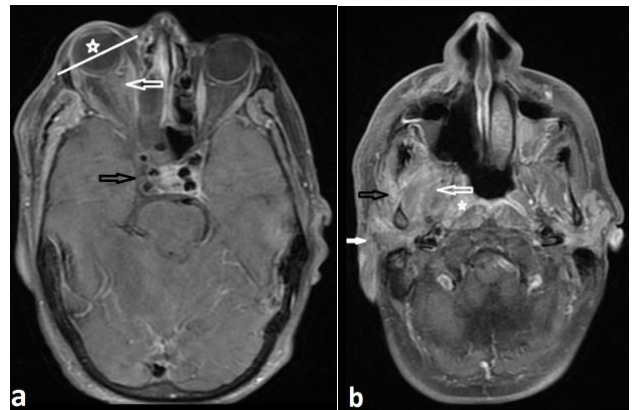
Figür 1: Ağız içinde sert damakta siyah nekrotik lezyon

Diğer sistem muayeneleri doğaldı. Hastanın laboratuvar değerlerinde; beyaz küre $19,55 \times 10^3/\mu\text{L}$, CRP 220mg/dL, glukoz; 292mg/dL, sodyum: 131 mEq/L, tam idrar tetkikinde keton pozitifliği, kan gazı incelemesinde pH: 7.369, HCO₃:16,8 mmHg, PCO₂ : 24,3 mmHg, PO₂:60,1 mmHg, baz defisiti:-10.6 tespit edildi. İlgili bölümlere konsülte edilen hasta mukormikoz ön tanısıyla kulak burun boğaz (KBB) servisine yatırıldı. KBB kliniğince çekilen maksilofasiyal bilgisayarlı tomografi'de (BT) paranasal sinüslerde mukozal kalınlaşma, sağ globda propitotik görünüm ve retrobulber yağ doku planlarında dansite artışı gözlemlendi (Figür 2). Orbital manyetik rezonans görüntüleme (MRG)' de sağ nazal konka düzeyinden orbitaya ve sağ mastikatör aralık-ptirgoid

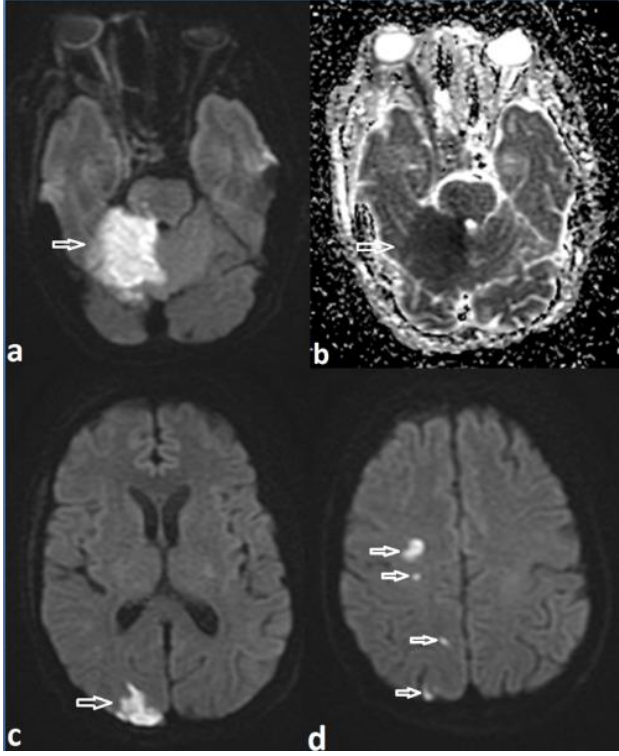


Figür 2. Bilgisayarlı Tomografi: Yıldız; Globda anteriora protrüzyon, Oklar; Retrobulber yağ planlarında kirlenmeyi göstermektedir.

kas dokularına uzanan inflamasyon ile kavernöz sinüste trombüs tespit edildi (Figür 3a, Figür 3b). Mevcut görüntüler DM öyküsü olan hastada mukor tutulumu açısından anlamlı olabilir şeklinde yorumlandı. Amfoterisin B ve ampisilin sulbaktam tedavisi başlandı. Hastaya nekrotik doku debritleme uygulandı. Patolojik incelemede doku ve damar invazyonunun eşlik ettiği, fungus sporları ve hiflerinin izlendiği mukormikozisle uyumlu bulgular saptandı. Yatışının 5. gününde uykuya eğilim gelişmesi üzerine çekilen serebral MRG'de sağ süperior serebellar arter sulama alanında akut enfarkt ile uyumlu sinyal değişiklikleri ve sağ paryetal lob yüzeysel ve derin border zonlarda enfarkt ile uyumlu bulgular saptandı (Figür 4). Gerekli tedavileri uygulanan hasta yaklaşık 3 ay sonra hastaneden taburcu edildi. Hastadan bu olgu sunumunun ve beraberindeki görüntülerin yayınlanması için yazılı bilgilendirilmiş onam alındı.



Figür 3: Manyetik Rezonans Görüntüleme a: Kontrastlı yağ baskılı T1A görüntüde; Yıldız : Globda anteriora protrüzyon, Beyaz Ok: Retrobulber yağ planlarında kirlenme, Siyah ok: Kavernöz sinüste trombüsü göstermektedir. b: Kontrastlı yağ baskılı T1A görüntüde; Sağ parafarengial alan, sağ medial ve lateral pterigoid kaslar bulunduğu mastikatör alan, sağ masseterik alan ve sağ parotid alandaki tutulumu göstermektedir. Yıldız : Parafarengial alan, Beyaz Ok: Medial ve lateral pterigoid kasların bulunduğu mastikatör alan, Siyah ok: Masseterik alan, İçi dolu beyaz ok : Parotid alan



Figür 4. Serebellar vermiş sağ kesiminde sağ superior serebellar arter sulama trasesinde difüzyon kısıtlaması izlenmiş olup (a) apparent diffusion coefficient (ADC) görüntülerde de karşılığı seçilmektedir (b). Sağ parietal lob yüzeyel (c) ve derin (d) border zonlarda da difüzyon kısıtlaması seçilmektedir.

Tartışma

Mukormikoz, başlıca bağışıklığı baskılanmış hastalarda ortaya çıkan yüksek mortalite (>% 50) ve sakatlık oranları ile ilişkili nadir ve ciddi bir fırsatçı enfeksiyondur. (5,6). Rinoserebral, gastrointestinal, pulmoner, kutanöz, disemine ve yaygın olmayan tip olmak üzere altı formu mevcuttur (1). En yaygın bilinen risk faktörleri; DM, lenfoid maligniteler, yanık, ciddi travma, böbrek yetmezliği ve steroid tedavisidir (6). Mukormikozis olgularının %36-88' inde DM özellikle DKA olduğu bildirilmiştir (7). Olgumuzda da acile servise başvurusu sırasında DKA kliniği mevcuttu.

Mukormikozisin bulaşı inhalasyon yolu ile olup sporların sinüse ve komşu dokulara invazyonu sonucu gelişir (7). Başlangıç semptomları göz kapağında şişlik, burun tıkanıklığı gibi sinüzit veya periorbital selülit düşündürülecek şekilde atipik olduğu için tanı genellikle geç konulur (2,6,7). Olgumuzda da ilk planda damaktaki yara nedeni olarak farklı etken olduğu düşünülerek tedavi önerilerinde bulunduğu ancak enfeksiyonunda yarattığı duruma sekonder olarak DKA kliniğinin geliştiği ve enfeksiyonun yayılımıyla propitoz, görmede bulanıklık, oftalmoplejinin geliştiği gözlenmiştir. Mukormikozun ayırt edici özelliği, anjiyoinvazyon ve trombozdan kaynaklanan doku nekrozudur, ancak nekrotik bir eskarın yokluğu tanıyı ekarte ettirmez. (1). Corzo-Leon ve arkadaşları DM'li hastalarda rino-orbito-serebral mukormikoz için "kırmızı bayraklar / uyarı işaretleri" olarak; kraniyal sinir felci, diplopi, sinüs ağrısı, proptozis, periorbital ödem, orbital apeks sendromu veya damak ülserini

önermiştir (5). Olgumuzda da damakta nekrotik yara, propitoz, ışık reflekslerinin alınmadığı tespit edilmiştir. Mantarlar, kan damarlarının duvarını kolayca invaze ederek tromboza ve doku iskemisine yol açabilir. Bu nedenle enfeksiyonun kavernoöz sinüs veya merkezi sinir sistemine yayılması nadir değildir (3). İntrakraniyal enfeksiyonun yayılması, beynin herhangi bir yerinde serebrit, apse oluşumuna, iskemik enfarktüs veya kavernoöz sinüs trombozuna yol açabilir. (7). Mental durumdaki bozulma, genellikle hastalık sürecinin intraserebral yayılımını gösteren bir işarettir. Bu semptomların tümü saatler içinde veya bir kaç günlük süreçte ortaya çıkabilir (3). Literatür ile uyumlu olarak olgumuzda süreç çok hızlı ilerlemiş, başvuru sırasında kavernoöz sinüste tromboz, yatışının 5. Gününde de santral görüntülemeye akut enfarktla uyumlu görünüm tespit edilmiştir. Mukormikozisin direkt penetrasyon ve kan damarı yoluyla yayılımı bu hastada olduğu gibi tromboz ve doku nekrozu eğilimini açıklamaktadır.

Klinik bulgular ve görüntüleme teknikleri, mukormikoz için karakteristik değildir ve çok sayıda vakada postmortem teşhis edilir (2). Tanı, yüksek klinik şüpheye dayanmasına rağmen, BT ve MRG, yayılımın belirlenmesinde önemli bir rol oynar. (8). Beyin veya sinüs BT'de; sinüs mukozasında veya ekstraoküler kaslarda kalınlaşma ve sinüslerde kemik erozyonunu içeren bulgular görülür. MRG, rinoserebral mukormikozisin intradural ve intrakraniyal boyutunu, kavernoöz sinüs trombozunu ve internal karotis arterin kavernoöz kısımlarının trombozunu belirlemede daha duyarlıdır. (2). Olgumuzda acil koşullarında hastaya ilk olarak BT tercih edilmiş ancak servise yatırıldıktan sonrası operasyon öncesi MRG çekilmiştir Olgumuzda MRG ve histopatolojik incelemenin her ikisinde de vasküler ve sinirsel invazyon gösterilmiştir.

Tedavi stratejisi; hızlı tanı, altta yatan tıbbi durumların stabilizasyonu, sistemik antifungallerin kullanımı ve gerektiğinde uygun cerrahi debridmanı içerir. Tedavinin süresi empiriktir ve ilaç uzun bir süre uygulanmalıdır. Amfoterisin B, etkili olduğu kanıtlanmış tek antifungaldir (3). Hastamıza da cerrahi debridman ve uzun süreli amfoterisin B tedavisi uygulanmıştır.

Mucorales tanımlaması histomorfolojik ve özellikle de kültür bazlı tanımlamaya dayanır (4). Kesin tanı, etkilenen dokuların biyopsilerinde mukor için tipik olan mantar hiflerinin gösterilmesine dayanır (1). Hastamızın patolojik örneklerinin incelemesinde doku ve damar invazyonun eşlik ettiği fungus sporları ve hifleri izlenen mukormikozis saptanmıştır.

Sonuç:

Hastalar ağız içinde/damakta oluşan yaradan bahsetmediği, atipik semptomlarla başvurdukları ve ağız içi çok iyi muayene edilmediği için geç tanı alabilmektedir. Teşhis, risk faktörlerinin tanınması, klinik belirtilerin değerlendirilmesi, görüntüleme yöntemlerinin erken kullanımı, histopatoloji ve

Görme Kaybına Neden Olan Mukormikozis

kültürlere dayalı tanı yöntemlerinin hızlı bir şekilde başlatılmasından oluşur. Erken tanı ve tedavi sağ kalımı arttırdığı için klinisyenin risk altındaki kişilerde yüksek bir klinik şüphe oluşturması esastır. Diyabet öyküsü olan, periorbital selülit, sinüzit kliniği, görme kaybı veya nörolojik bulgularla acil servise başvuran hastalarda mukor mikozis akılda tutulmalı, orofarinks iyice muayene edilmeli gerekirse tedaviye hemen başlanmalıdır

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Yazarların Katkısı: Yazarlar vakanın hazırlanması ve yazmına eşit oranda katkı sağlamıştır.

Aydınlatılmış Onam Formu: Hastadan bu olgu sunumunun ve beraberindeki görüntülerin yayınlanması için yazılı bilgilendirilmiş onam alındı. Yazılı onamın bir kopyası dergide incelenmek üzere mevcuttur.

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Triage Attitude of Health Professionals Who Work in Emergency Services

Acil Serviste Görev Yapan Sağlık Profesyonellerinin Triyaj Tutumları

Hilal Durmaz¹ , Sevil Pamuk Cebeci²

ABSTRACT

Triage is defined as the rapid selection and coding process, prioritization, which is performed at the scene and in the health institution where they are transported, in order to determine the priority treatment and those who need to be transported in the case of a large number of patients and injured. It is the golden application required to provide faster and higher quality health care services in emergency services. While this application focuses on using the resources of the health institution efficiently at the right place and at the right time, it also prevents the waiting intensity in the emergency services and helps to reduce the morbidity and mortality rate. There are five and three levels of triage at the international and national level. Health professionals who practice triage are also diverse, and physicians, nurses, emergency medical technicians and health officers can practice triage. This diversity is reflected in triage application success rates. This article was written to examine the triage attitudes of healthcare professionals working in emergency departments. The triage duties of health professionals working in the emergency department should be specified in detail in the regulation. Paying attention to the application of triage in undergraduate education, adding triage training to the content of First Aid and Emergency Care course, regularly informing health professionals about the innovations in triage in their in-service training after graduation will be useful in eliminating the deficiencies and applying triage more successfully.

Keywords: Emergency service, nurse triage, attitude.

ÖZ

Trijaj, çok sayıda hasta ve yaralının bulunduğu durumda, öncelikli tedavi ve nakil edilmesi gerekenlerin tespiti amacıyla, olay yerinde ve ulaştırıldıkları sağlık kuruluşunda yapılan hızlı seçme ve kodlama işlemi, önceliklendirme olarak tanımlanır. Acil servislere daha hızlı ve kaliteli sağlık bakım hizmeti verebilmek için gereken altın uygulamadır. Bu uygulama doğru yerde ve doğru zamanda, sağlık kurumunun kaynaklarını verimli şekilde kullanmaya odaklanırken aynı zamanda acil servislerdeki bekleme yoğunluğunu önler, morbidite ve mortalite oranının azalmasına yardımcı olur. Uluslararası ve ulusal düzeyde beşli ve üçlü düzeylerde triyaj uygulaması mevcuttur. Triyajı uygulayan sağlık profesyonelleri de çeşitlilik göstermekte, hekim, hemşire, acil tıp teknisyeni ve sağlık memuru triyaj uygulaması yapabilmektedir. Bu çeşitlilik triyaj uygulama başarı oranlarına da yansımaktadır. Bu makale acil servislere görev yapan sağlık profesyonellerinin triyaj tutumlarını incelemek amacıyla yazılmıştır. Yönetmelikte acil serviste görevli sağlık profesyonellerinin triyaj görevleri ayrıntılı olarak belirtilmelidir. Lisans eğitiminde triyaj uygulamasının önemsenmesi, ilkyardım ve Acil Bakım dersi içeriğine triyaj eğitiminin eklenmesi, mezuniyet sonrası göreve başlayan sağlık profesyonellerinin hizmet içi eğitimlerinde triyajdaki yenilikler hakkında düzenli olarak bilgilendirilmesi, eksikliklerin giderilmesinde ve daha başarılı triyaj uygulanmasında faydalı olacaktır.

Anahtar Kelimeler: Acil servis, hemşire triyajı, tutum

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Giriş

Tarihsel açıdan baktığımızda ilk triyaj 1804-1814 arasında Fransa'da imparator Napolyon Bonaparte döneminde uygulanmıştır. Napolyon'un baş cerrahı Dominique Jean Larrey, savaş sırasında tıbbî kaynakların iyi bir şekilde yönetilmesi amacıyla ağır yaralı askerlere herhangi bir müdahalede bulunmayıp hafif yaralı askerlere uygun tedaviler sağlayarak savaşa dönüş yapmaları için triyaj uygulamıştır (1). Askerleri daha hızlı cepheye döndürmek ve tıbbî kaynakları daha verimli kullanmak için askerler arasında bir seçim yoluna gidilmiş,savaşın acı yüzü olarak, ağır yaralı askerler ölüme terk edilip iyileşme olasılığı yüksek askerler tedavi edilmiştir (2). Triyajın gelişimi savaşlarla paralellik göstermektedir. Triyaj, II. Dünya savaşında süreç anlamını kazanmış ve tıbbî kaynakların çoğaltılmasını sağlamıştır. Savaş alanındaki bu gelişmeler sivil alana da yansımış, ilk triyaj 1963'de Amerika Birleşik Devletleri (ABD) Yale Newhaven Hastanesinin acil bölümünde uygulanmış ve 1964'de Weinermann ve arkadaşları ilk sivil triyaj uygulamasını yazılı

olarak bildirmiştir (3). Bildiride triyaj ihtiyacının acil servislere başvuran ağır hasta ve acil olmayan hasta sayısındaki artıştan kaynaklandığı belirtilmiştir. Etimolojik olarak Fransızca bir kelime olan "trier" kelimesinden türetilen triyaj kelimesi,"filtreleme" veya "sıralama" anlamına gelmektedir (4). Triyaj'ın Türkçe karşılığı ise "önceliklendirme"dir (5). Yönetmelikte "*çok sayıda hasta ve yaralının bulunduğu durumlarda, öncelikli tedavi ve nakil edilmesi gerekenlerin tespiti amacıyla, olay yerinde ve ulaştırıldıkları sağlık kuruluşunda yapılan hızlı seçme ve kodlama işlemi*" şeklinde tanımlanmaktadır (5). Ryan (2008) ise triyajı, hayatı tehdit eden vakaları belirlemek, yönlendirmek ve tahliye etmek şeklinde tanımlamıştır (Tablo 1) (6).

Triyaj fizyoloji, güvenlik, sevgi, öz saygı, kendini gerçekleştirme temelinde Maslow'un ihtiyaçlar hiyerarşisine dayanır. Acil servislere bu durum ABCDE (Airway, Breathing, Circulation, Disability and Exposure)-yani hava yolu, solunum, dolaşım, nörolojik durum ve tüm vücudun incelenmesi- olarak tanımlanır.Bu koşulların yanında ağrı,

Triyaj Sistemi	Ülkeler	Seviyeler	Hastanın Bakım Süresi
Aciliyet Şiddeti İndeksi	ABD	ESI – 1	Süre Yok
	Avustralya	ESI – 2	
	Kanada	ESI – 3	
	Birleşik Krallık	ESI – 4	
		ESI – 5	
Avustralya Triyaj Sistemi	Avustralya Yeni Zelanda	1- Restüsitasyon	Seviye 1- 0 dk
		2- Çok Acil	Seviye 2- 10 dk
		3- Acil	Seviye 3- 30 dk
		4- Az acil	Seviye 4- 60 dk
		5- Acil Olmayan	Seviye 5- 120 dk
Manchester Triyaj Sistemi	İngiltere İskoçya	1- Hemen (Kırmızı)	Seviye 1- 0 dk
		2- Çok Acil (Turuncu)	Seviye 2- 10 dk
		3- Acil (Sarı)	Seviye 3- 60 dk
		4- Standart (Yeşil)	Seviye 4- 120 dk
		5- Acil Olmayan (Mavi)	Seviye 5- 240 dk
Kanada Triyaj Sistemi	Kanada	1- Restüsitasyon	Seviye 1- 0 dk
		2- Çok Acil	Seviye 2- 15 dk
		3- Acil	Seviye 3- 30 dk
		4- Az acil	Seviye 4- 60 dk
		5- Acil Olmayan	Seviye 5- 120 dk

Tablo 1.Triyaj Sistemleri

kanama, sıcaklık, bilinç düzeyi ve akut koşullar da dikkate alınır. Richardson (2006) mevsimsel, vardiya ve haftanın gününe göre oluşan belli yoğunluklarda morbidite ve mortalitenin arttığını belirlemiştir (7). Bu bakımdan triyaj, acil servislerde hastaların bakımını tamamlayıcı niteliklerdendir. Bu sistem doğru yerde ve zamanda, sağlık kurumunun kaynaklarını verimli şekilde kullanmaya odaklanır; acil servislerdeki bekleme yoğunluğunu önler, morbidite ve mortalite oranının azalmasına yardımcı olur (8). Triyaj için hastane öncesi ve hastanede olmak üzere dört farklı alan tanımlanmıştır. Bunlar: sahada afet triyajı, sahada iletişime bağlı triyaj, acil serviste afet triyajı ve rutin acil servis triyajı olarak sıralanmaktadır. Bugün hastanelerin acil servislerinde rutin acil servis triyajı kullanılmaktadır (2). Triyaj sistemleri bu zamana kadar 3'lü, 4'lü, 5'li sistemler olarak sınıflandırılmıştır. 5'li sistemler 3'lü ve 4'lü sistemlere göre daha güvenli, hastaları doğru acil alanlarına yönlendirmede daha duyarlıdır. Bu yüzden güncel olarak baktığımızda 5'li triyaj sistemlerinin daha çok kullanıldıkları görülmektedir. Geçerlilik ve güvenilirliği kanıtlanmış yaygın kullanılan 5'li triyaj sistemleri:

- Aciliyet Şiddeti İndeksi (Emergency Severity Index -ESI),
- Avustralya Triyaj Sistemi -ATS/Ulusal Triyaj Sistem-UTS/National Triage System -NTS,
- Manchester Triyaj Sistemi (Manchester Triage System -MTS),
- Kanada Triyaj Sistemi (Canadian Triage and Acuity Scale -CTAS)'dir(9).

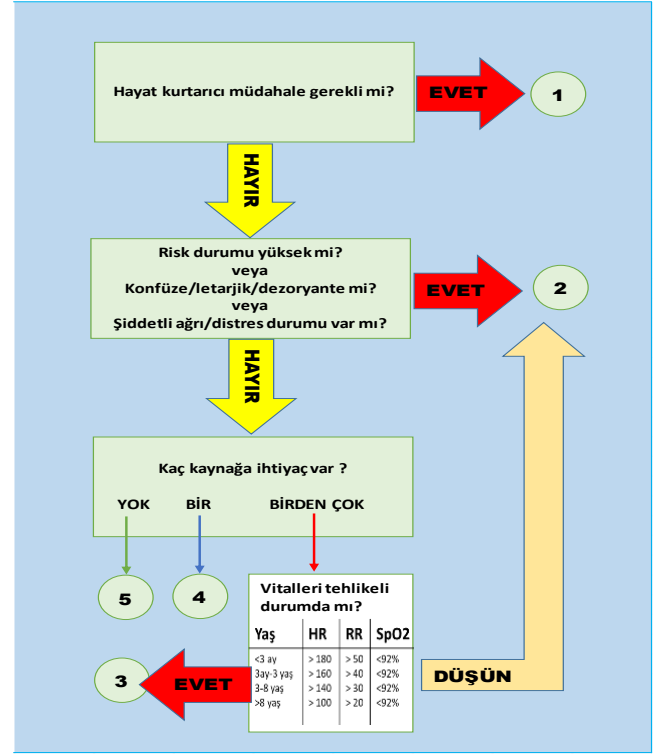
Aciliyet Şiddeti İndeksi (Emergency Severity Index -ESI)

Aciliyet Şiddeti İndeksi (Emergency Severity Index, ESI) ilk olarak 1990'larda ABD'de kullanılmıştır ve birçok ülkede (Avustralya, Kanada, Birleşik Krallık vb.) triyaj sisteminin temellerini oluşturmuştur (10). Bu sistem acil tıp uzmanları ve acil servis hemşireleri tarafından geliştirilmiştir. ESI'de sırasıyla 1 en yüksek 5 en düşük olmak üzere beş seviye bulunmaktadır. Hemşirenin sorduğu kısa sorular hastanın hangi seviyede değerlendireceğini belirler:

1. seviye hayatî önem taşır. Acil müdahale gerektiren hasta ve yaralıdır. Bunlara örnek, kardiyak arrest gelişimi, ciddi solunum sıkıntısı, bilinç bozukluğu, dolaşım bozukluğu yapan taşikardi, bradikardi, hipoglisemi, anafilaksi örnek verilebilir. 2. seviye bekleyemeyecek olan hastalardır. Göğüs ağrısı, inme, şiddetli ağrısı olan hasta, anibilinç değişikliği olan yaşlı, intihar düşüncesi olan hasta, gastrointestinal sistem kanaması, pnömotoraks örnek verilebilir. 3. seviye; hayatî bulguları normal olup, iki veya daha fazla kaynakla tedavi edilebilecek hastalardır. Pnömoni, karın ağrısı, kırıkşüphesi gibidurumlar örnek verilebilir. Ancak iki veya daha fazla kaynak kullanıldığı hâlde hayatî bulguları anormal olan hastalar 2. seviyeye gönderilir.

4. Seviye bir kaynak kullanılıp hayatî bulguları normal olan hastalardır. Örneğin; basit kesi, burkulmalar, idrar yolu enfeksiyonu örnek verilebilir. 5. Seviye hayatî bulgularınormal olan ve kaynak kullanılmayan kısacası muayene ile karar verilebilecek durumundaki hastalardır. Boğaz ağrısı, burun akıntısı, regl ağrısı örnek verilebilir. ESI literatürde uygulanması kolay, hasta için güvenilir ve bekleyiş sürelerini azaltan bir triyaj sistemi olarak görülmektedir. Açık ve anlaşılır olması uygulayıcılara

öğretme açısından önemli kolaylıklar sağlamaktadır (Şekil 1) (2).



Şekil 1. Aciliyet Şiddeti İndeksi

Avustralya Triyaj Sistemi -ATS/National Triage System -NTS / Ulusal Triyaj Sistemi -UTS

Avustralya'da 1980'li yıllarda Jelinek ve Fitzgerald tarafından geliştirilen Ulusal Triyaj Sistemi (UTS), 1994'de Avustralya acil servislerinde zorunlu hâle gelmiştir. UTS, 2000'lerde Avustralya Triyaj Sistemi (ATS) olarak değiştirilmiştir. ATS beş seviyeden oluşmaktadır. Her bir seviye hastanın sağlık durumuna ve buna bağlı bekleyebileceği süreye göre oluşturulmuştur (11).

Birinci seviye hayatî tehlike mevcut olan hastalar içindir. Bu tip hastalara hemen müdahale edilmesi gerekmektedir. Örneğin; kalp durması, solunum durması, Glasgow koma skalasının (GKS) 9'dan küçük olması, aşırı solunum sıkıntısı, kan basıncının 80'den küçük olması gibi durumlarda birinci seviyeye başvurulur. İkinci seviye yaşam tehdidi yakın olan hastalar içindir. 10 dakika içinde müdahale edilmesi gerekmektedir. Örneğin; ciddi kan kaybı, GKS'nin 13'ten küçük olması, diastolik kan basıncının <50'den küçük, sistolik kan basıncının>150'den büyük olduğu durumlar, şüpheli sepsis gibi durumlarda hasta ikinci seviyeye yönlendirilir. Üçüncü seviye yaşam tehdidi olasılığı olan hastalar içindir. İlk 30 dakikada müdahale edilmesi gerekmektedir. Örneğin; şiddetli hipertansiyon, orta derecede kan kaybı, şiddetli kusma, dehidrasyon, orta derecede ağrı, yüksek risk özellikleri olmayan karın ağrısı gibi durumlarda hasta üçüncü seviyeye yönlendirilir. Dördüncü seviye durumu ciddi olma olasılığı olan hastalar içindir. 60 dakika içinde müdahale edilmesi gerekmektedir. Örneğin; hafif kanama, yabancı cisim aspirasyonu, dehidrasyon olmaksızın ishal veya kusma, hafif burkulmalar gibi durumlarda hasta dördüncü seviyeye yönlendirilir. Beşinci seviye ise acil olmayan hastalar içindir. 120 dakika içinde müdahale edilmesi gerekmektedir. Örneğin ufak yaralar ve sıyrıklar, hafif ağrılar, planlanmış ziyaretler (pansuman, yara incelenmesi) gibi durumlarda hasta beşinci seviyeye yönlendirilir (12).

Kanada Triyaj Sistemi (Canadian Triage and Acuity Scale-CTAS)

Kanada Acil Hekimleri Derneği (The Canadian Association of Emergency Physicians) 1995'de 5 aşamalı Canadian Triyaj Skalası (CTAS)'ni Kanada'daki tüm acil servislerde kullanılmasını önerdi. 5

aşamanın bölümleri; resüsitasyon, çok acil, acil, daha az acil ve acil olmayan olarak tanımlanmıştır. Bu triyaj sistemi 1994'de tasarlanan Avusturalya Triyaj sisteminden esinlenerek yapılmıştır. 1997'de Kanada Acil Hekimleri Derneği ve Kanada Ulusal Acil Hemşireler Birliği (The National Emergency Nurses Affiliation of Canada) tarafından bu sistem onaylanıp Kanada sağlık politikasına dahil edilmiştir (13). 2001'de pediatrik versiyonu geliştirilmiş, 2004'de de triyaj hemşirelerine yardımcı olmak için revize edilmiş hâli yayımlanmıştır (14). 2016'da ise bekledikçe durumu kötüleşecek, zayıf hastalar için kırılabilirlik baz alınarak aciliyet durum seviyesi yükseltilmiş tekrar revize edilmiştir (15).

Manchester Triyaj Sistemi (Manchester Triage System - MTS)

Kraliyet Kaza ve Acil Durum Üniversitesi (The Royal College of Nursing Accident and Emergency Association-RCN) ve İngiliz Kaza ve Acil Tıp Derneği (The British Association for Accident and Emergency Medicine-BAEM) tarafından 1994'de Manchester Triyaj Grubu (Manchester Triage Group- MTG) kurulmuştur. MTG'nin yaptığı çalışmalar sonucu hastanelerde farklı uygulamalar belirlenmiş ve ortak bir uygulama için MTS geliştirilmiştir (16). MTS 5 seviyedir; her bir seviye, isim, renk ve hastaya müdahale süresi açısından tanımlanmıştır (Tablo 2).

Seviye	İsim	Renk	Bekleme Zamanı
1	İmmediate (Hemen)	Kırmızı	0
2	Very Urgent (Çok acil)	Turuncu	10
3	Urgent (Acil)	Sarı	60
4	Standart (Normal)	Yeşil	120
5	Non-urgent (Acil olmayan)	Mavi	240

Tablo 2. Manchester Triyaj Sistemi (Manchester Triage System - MTS)

Türkiye'de Kullanılan Triyaj Sistemi

Türkiye'de ilkyardım ve acil müdahalenin gelişimi dünyadaki gelişime paralel olarak savaşlara dayanmaktadır. Florence Nightingale, 1854-1856 Kırım Savaşı'nda Selimiye Kışlası'nın hastaneye çevrilmesiyle yaralı askerlere bakım vermiştir (17). Sonraki yıllarda 1911 Trablusgarp Savaşı ve 1912 Balkan Savaşı ilkyardım ve acil müdahalenin önemini göstermiştir. Triyaj uygulamasının temelleri, yaralı asker sayısının fazlalığı nedeniyle, askerlerin ağır ve hafif yaralı şeklinde ayrılmasıyla atılmıştır. İlyardım ve acil uygulamaları 11 Haziran 1868 tarihinde "Osmanlı Yaralı ve Hasta Askerlere Yardım Cemiyeti"nin kurulmasıyla resmîyet kazanmıştır. 1877'de Marko Paşa başkanlığında toplanan cemiyetin adı dönemin padişahı Abdülhamit Han tarafından "Hilâlî Ahmer Cemiyeti" olarak değiştirilmiş, cumhuriyetin ilanı ile birlikte bu cemiyet "Türkiye Cumhuriyeti Kızılay Cemiyeti" adını almıştır (18). Cumhuriyetin ilanı ile birlikte Türkiye'de modern hemşireliğin gelişimi hız kazanmıştır. Hemşirelik eğitimi alanında çeşitli okulların açılması bu durumu desteklemektedir. 1920'de Amerikan Hastanesi bünyesinde açılan Amiral Bristol Özel Sağlık Meslek Lisesi, 1925'de Kızılay Özel Hemşirelik Lisesi bu dönemde açılan ilk hemşirelik okullarıdır. Bu okulları 1939'da Ankara'da Millî Savunma Bakanlığı'na bağlı Askeri Hemşirelik Okulu ve 1943'de Tefik Sağlam Hemşirelik Lisesi izlemiştir. 1946'dan itibaren Sağlık Bakanlığı tarafından çok sayıda lise düzeyi hemşirelik okulu açılmıştır (19).

1961'de yayımlanan 224 sayılı "Sağlık Hizmetlerinin Sosyalleştirilmesi Hakkında Kanun" ile sağlık hizmetleri ülke genelinde tüm vatandaşların ulaşabileceği şekilde genişletilmiştir. Tıp alanındaki gelişmeler yeni uzmanlık dallarının oluşmasını sağlamıştır. Bu nedenle 1993'de "Acil

ve İlyardım" adı ile kabul edilen Acil Tıp Uzmanlık Anabilim Dalı'nda uzmanlar yetişmeye başlamıştır (20). Hemşirelerin uzmanlığının arttırılması, meslekte branşlaşma, hastalara daha kaliteli bakım verme, bilimsel araştırmalar yapma, sağlık kurumlarına yöneticiler yetiştirme gibi amaçlarla da lisans, yüksek lisans ve doktora eğitim programları açılmıştır. Üniversite düzeyinde hemşirelik eğitimi ilk kez 1955'de Ege Üniversitesi Hemşirelik Yüksekokulu'nda başlamış, 1968 ve 1972'de Hacettepe Üniversitesi'nde sırasıyla yüksek lisans ve doktora programlarıyla süregelmiştir (21). İlyardım ve acil tedavi alanında triyaj, tedavi ve bakım uygulayan meslek üyelerinin, bilgi ve becerilerini arttırmak amacıyla, Vehbi Koç Vakfı Semahat Arsel Hemşirelik Eğitim ve Araştırma Merkezi (SANERC) 1994'de "Acil Hemşireliği Kursu" başlatmıştır. 1995'de kurulan Acil Tıp Derneği ile Ulusal Travma ve Acil Cerrahi Derneği de düzenli eğitim ve kurs programları yürütmektedir (18).

Türkiye'de triyaj kavramının uygulanması ile ilgili hükümler 11 Mayıs 2000'de yayımlanan Acil Sağlık Hizmetleri Yönetmeliği'nde geçmektedir. Yönetmelik 15. madde; 24 saat kesintisiz acil sağlık hizmeti veren kurum ve kuruluşlarda "Acil hasta ve yaralıları karşılanarak, ilk tıbbî müdahale ve tıbbî bakım yapılır. Hasta veya yaralıları için yönlendirme merkezinin bilgisi dahilinde yapılır" şeklinde ifade edilmiş ve aynı maddenin devamında "Başvuran her hasta için acil tıbbî değerlendirme, müdahale ve gerektiğinde stabilizasyon sağlanır" cümlesiyle triyaj kavramıyla ilgili genel esaslar belirtilmiştir. Maddenin (d) fıkrasında acil servislerin fiziki niteliklerinden bahsedilmiştir. 2004'de yapılan değişiklikte niteliklere yenileri eklenmiş ve acil servislerde triyaj alanlarının bulunması gerektiği belirtilmiştir (5).

16 Ekim 2009'da sağlık bakanlığının yataklı sağlık tesislerinde acil servis hizmetlerinin uygulama usul ve esasları hakkındaki tebliğinde triyaj uygulamasını tabip veya acil tıp teknisyeni, hemşire, sağlık memuru (toplum sağlığı) ve benzeri nitelikteki sağlık personeli tarafından yapılacağı beyan edilmiştir. Türkiye'deki triyaj uygulaması yine aynı tebliğde; triyaj alanları kırmızı (çok acil), sarı (acil) ve yeşil (acil olmayan) alan şeklinde üçe ayrılmıştır. 2018'de yayımlanan Acil Servis Genelgesi'nde ise yeşil alan; "yeşil alan-1" ve "yeşil alan-2" şeklinde tekrar düzenlenmiştir (22). Açıklanan sistem üç aşamalı triyaj sistemleriyle benzerdir.

Türkiye'de Sağlık Bakanlığı'na bağlı devlet hastanelerinin acil servislerinde 3'lü triyaj sistemi uygulanırken bazı üniversite hastaneleri ve özel hastanelerde 5'li triyaj sistemi uygulanmaktadır. 2013'de Sağlık Bakanlığı Yataklı Tedavi Kurumları İstatistik Verilerine göre ülkemizde hasta başvurusu yıllık 82 milyon 308 bin 86'yken, bazı acil servislere günlük başvuru sayısının 2000 civarında olduğu bildirilmektedir. 2017'de Kamu Hastaneleri İstatistik Raporuna bakıldığında 101 milyon 445 bin 329dur (23). 2013-2017 verilerini kıyasladığımızda hasta sayılarının arttığı ve hastanelerdeki acil servislerin aktif bir şekilde işlediği görülmektedir. Bu da bize triyaj kavramının önemini göstermektedir (Tablo 3).

Acil Servislerde Çalışan Sağlık Profesyonellerinin Triyaj Tutumları

Acil servislerde triyajın gelişimine baktığımızda; hekimler, hemşireler, paramedikler ve sağlık memurları tarafından

RENK	ALAN VE VAKA NİTELİĞİ	VAKANIN YÖNLENDİRİLDİĞİ BİRİM KRİTERLERİ
YEŞİL	Kategori 1: Ayaktan başvuran, genel durumu stabil, akut semptomları nedeniyle 1 saatten fazla bekleme hayati tehdit veya komplikasyon oluşturabilecek basit sağlık sorunları bulunan hastalar	Bu kategoride olan hastalar acil servis içinde yeşil alanda muayene edilmelidir.
	Kategori 2: Ayaktan başvuran, genel durumu stabil, 1-4 saat arası bekleme hayati tehdit oluşturmayan, basit sağlık sorunları bulunan hastalar	Bu kategoride olan hastalar acil servise entegre edilmiş olan mesai kaydırma veya vardiya branş polikliniklerine yönlendirilirler.
SARI	Kategori 2: Hayati tehdit etme olasılığı, uzuv kaybı riski ve önemli morbidite oranı olan durumlar.	Bu kategoride değerlendirilen hastalar triyajdan sorumlu hekimin bilgisi dahilinde doğrudan ilgili tedavi alanına alınmalıdır.
	Kategori 2: Orta ve uzamış dönem belirtileri olan ve ciddiye potansiyeli taşıyan durumlar. (solunum sayısı, nabız, kan basıncı, oksijen saturasyonu, vücut sıcaklığı anormal olan hastalar ve ağrı skoru maksimum skorun %80 altında olan hastalardır.	Bu kategoride değerlendirilen hastalar triyajdan sorumlu hekimin bilgisi dahilinde doğrudan ilgili tedavi alanına alınmalıdır.
KIRMIZI	Kategori 1: Hayati tehdit eden ve hızlı, agresif yaklaşım ve acil olarak eş zamanlı değerlendirme ve tedavi gerektiren durumlar. Bu durumda hasta hiç bekletilmeden kırmızı alana alınır.	Kırmızı ana renk kodunda değerlendirilen hastalardan bilinci kapalı, hava yolu güvenliği, solunum ve dolaşım olmayan hastalar hemen yeniden canlandırma (resusitasyon) odasına alınacaktır.
	Kategori 2: Hayati tehdit etme olasılığı yüksek olan ve 10 dakika içerisinde değerlendirilip tedavi edilmesi gerekli durumlar.	Bilinci kapanabilecek, hava yolu güvensiz ve solunumu durabileceği ön görülen hastalar doğrudan kırmızı alana alınacaktır.

Tablo 3. Renk kodlaması ve Triyaj Uygulaması (26)

yapıldığını görmekteyiz. İlk uygulamaları 1964'de Yale Newhaven Hastanesi'nde uygulanmaya başlayan triyaj sistemi, yeterince gelişmemesi nedeniyle 1980'lere kadar hekimler tarafından uygulanmıştır (3,24). Bu durum ülkemizde de 2004'de yayımlanan yönetmeliğe kadar benzer bir şekilde işlemiştir. Akyolcu (2006)'nın "Trijaj kimler tarafından uygulanır?" adlı çalışmada acil serviste hastanın triyajını, hemşirelerin %43,7'si hekimlerin yaptığını belirtmiş olup yukarıdaki yargıyı destekler niteliktedir (29).Günümüzde hastanelerin ve acil servislerin, hasta grubunun özellikleri ve personel durumuna göre triyajı yapan kişilerin belirlenmesi hastane idareleri ve acil servis sorumlularının inisiyatifindedir (26). Hekimler nadiren triyaj uygulamasına dahil olurlar, ancak triyaj personeli için bir hekim hemen ulaşılabilir ve erişilebilir olmalıdır.

Acil servislerde hekimlerin uyguladıkları triyaj, genellikle kıdemli hekimlerin ambulansla gelen kırmızı alan hastasına triyaj yapmalarıyla bilinmektedir. Acil servise ambulansla gelen her hasta direk kırmızı alana alındığından kıdemli hekimler acil müdahale gerektiren bir hasta geldiğinde erken müdahale gerektiği için triyaj yapmaktadır (24). Yine çocuk acil servislerinde triyaj uygulamaları yeterince gelişmediği için triyajı hekimler yapmaktadır (27). Burström ve ark. (2012)'nin İsveç'te üç hastanede farklı triyaj uygulamalarının (hekim liderliğinde triyaj, hemşirenin ardından acil hekiminin değerlendirdiği triyaj ve hemşirenin ardından pratisyen hekimin değerlendirdiği triyaj) karşılaştırıldığı çalışmada hekim liderliğinde yapılan triyajın verimlilik ve bekleme süreleri açısından daha avantajlı olduğu belirtilmiştir (28). Burström ve ark. (2015)'nin başka bir çalışmada 2008-2012 yılları arasındaki veriler incelenmiş hekim liderliğindeki triyajın bekleme sürelerini 34 dk. azalttığı aynı zamanda acil servise giden hastaların ölüm oranlarının da azaldığı belirtilmiştir (29). Triyajda acil hekimin etkisini değerlendirmek için yapılan çalışmada triyaj hemşiresiyle birlikte kıdemli bir acil hekiminin görev yapmasıyla bekleme

sürelerinin önemli ölçüde kısaldığı belirtilmiştir. Choi ve ark. (2006)'nın çalışma verileri de bu durumu destekler niteliktedir. Çalışmada hekimlerin triyaj yapması sonucu bekleme süresinin %38, ortalama işlem süresinin de %23 azaldığı belirtilmiştir (30).

Esmailian ve ark. (2014)'nin çalışmasında hemşire ve hekim triyajı arasında anlamlı bir fark olmadığı belirtilmiştir (10). Benzer şekilde Han ve ark. (2010)'nin yaptıkları çalışmada da hastaların acil serviste kalış sürelerinde önemli bir azalma olmadığı gözlenmiştir. (31). Ersoy ve Akpınar (2010)'ün Kocaeli'nde acil servis hekimlerinin triyaj kararlarını değerlendirdikleri çalışmada ise acil hekimlerinin yaralıları için triyaj kararı vermede yetersiz oldukları belirtilmiştir (32). Çoğu zaman altın standart şeklinde kabul edilen hekim kararlarının doğru olmadığı durumlar söz konusu olabilir. Triyaj konusunda standartları belirleyen kılavuzlar veya sınıflandırmalar şu anda mevcut değildir. Triyajın standartlarını belirleyen kılavuzlar veya sınıflandırmalar kullanıldığında, sağlık çalışanlarının hastalara doğru şekilde triyaj yapma olasılıkları önemli ölçüde yükselecektir (33). Sarıkaya (2004)'nın çalışmasında göğüs ağrısı gibi belirli şikayetler için triyaj kılavuzlarının hazırlanmasının hemşirelerin ve doktorların kararları arasındaki tutarlılığı artırdığı gösterilmiştir.

Paramedikler ve acil tıp teknisyenleri daha çok ambulanslarda hastalara eşlik etmektedir. Bu durum birçok ülkede benzerlik göstermektedir (40). Dünya çapında acil servislerde triyaj hemşiresine bir alternatif paramedikler gösterilebilir. Pointer ve ark. (2001) tarafından yapılan çalışmada uygun tanı ve tedavi prosedürleri uygulanarak paramedikler tarafından da triyajın uygulanabileceği belirtilmiştir (41). Bununla birlikte, Yıldırım (2017)'in paramedik öğrencilerinin acil tıp kliniğinde uyguladıkları tıbbi becerilerin değerlendirildiği çalışmada, öğrencilerin en çok zorlandıkları beceriler arasında triyaj uygulamasının bulunduğu bildirilmiştir (42).

Trijaj konusunda standartları belirleyen kılavuzlar veya sınıflandırmalar şu anda mevcut değildir. Triyajın standartlarını belirleyen kılavuzlar veya sınıflandırmalar kullanıldığında, sağlık çalışanlarının hastalara doğru şekilde triyaj yapma olasılıkları önemli ölçüde yükselecektir (33).

Literatürü taradığımızda Dünya'daki ve Türkiye'deki acil servislerde triyaj uygulamasını genellikle hemşireler yapmaktadır (33). 2010 yılında yayınlanan Hemşirelik Yönetmeliği'nde acil servis hemşiresinin görevlerinden biri hastaların acil servise kabulünü sağlamak olarak belirtilmiştir (34). Bu nedenle acil servislerde kullanılan çeşitli triyaj sistemlerinin gelişmesinde hemşirelerin "hasta aciliyeti" ve "zaman" bakımından gözlemleri önemli rol oynamıştır (35). Türkiye'de Acil Servis Triyaj araştırmaları genellikle hemşireler üzerine odaklanmıştır. Uluslararası literatürde yapılan araştırmalarda bu duruma paralellik göstermektedir. Bu tutumdan dolayı triyaj hemşiresine önemli sorumluluklar yüklenmektedir (24, 36). Acil servislerde hastaların kalabalığı, her hastanın kendini en öncelikli hasta hissetmesinden kaynaklı anksiyetik davranışlarından dolayı triyaj hemşiresi kişilerarası iletişimde problem çözücü ve çözüm odaklı olmalıdır. Ayrıca doğru ve hızlı karar verme mekanizmalarını geliştirip hastaları en verimli şekilde alanlarına yönlendirmelidir. Doğru ve hızlı kararı verebilmek için; acil konusundaki bilgilerini güncel tutması, en az altı

aylık acil servis tecrübesi ve triyaj konusunda eğitimler almaları önemlidir (27).

Trijaj eğitimi lisans düzeyinden başlayıp acil servis sürecinde de hizmet içi eğitimlerle desteklenmelidir. Akyolcu ve ark. (2006)'nın acil servislerde çalışan hemşireler üzerinde yaptığı çalışmada; triyaj eğitimi almayan hemşirelerin %87 oranında bulunduğu ve triyaj tanımını bilenlerin %23 gibi düşük bir oranda çıktığı bildirilmiştir (25). Avustralya'da yapılan bir çalışmaya katılan hemşirelerden %42'si triyaj eğitimi olmadığını, eğitim alanlardan %14'ü ise triyaj görevi yapmaya hazır olmadığını belirtmiştir (36). Sungur ve ark. (2009)'nın yaptıkları çalışmada ise katılımcıların %64,7'sinin triyaj eğitimi almadığı, triyaj tanımını bilenlerin %67,6 olduğu bildirilmiştir (26). Bu da bize 2000 yılında triyajla ilgili ilk yayımlanan yönetmelikte triyaj kelimesi kullanılmayıp, bunun yerine "yönlendirme" kavramının kullanılmasının etkisi olabileceğini düşündürmektedir. Küçükoğlu ve ark. (2017)'nin yaptıkları çalışmada triyaj tanımını bilenlerin oranı %93,5 çıkarken triyaj konusunda kendilerini yeterli hissetmeleri %72,7 çıkmıştır (27). 2004'de yayımlanan yönetmelikte ilk kez triyaj kavramı kullanılmış, hastanelerde triyaj alanı bulunması gerektiği belirtilmiştir. Yapılan çalışmalarda triyaj tanımı bilgi düzeyinin artışı triyaj kavramının yönetmeliklerdeki gelişimiyle paralellik göstermektedir. Hizmet içi triyaj eğitimlerinin yeterince yapılmadığı yapılan çalışmalarda verilerde görülmektedir. Tarhan ve Akin (2016)'ın yaptığı çalışmada hemşirelik eğitimi gören lisans öğrencilerinin triyaj tanımını bilme oranları %88 iken triyajın renklerini bilme oranı %28,8 olarak tespit edilmiştir. Triyaj tanımını bilme oranlarındaki yüksek bulgu; öğrencilerin klinik deneyimleri, günlük yaşamdaki acil servis gözlemleri olarak tanımlanabilir. Triyajın renklerini bilme oranlarındaki düşüklük ise uygulama anlamında lisans eğitiminde triyaj konusundaki uygulama yetersizliğini düşündürmektedir (36). Acil servislerde aşırı yoğunluğun azaltılmasında triyaj hemşiresinin rolünün incelendiği sistematik bir çalışmada; 1971-2011 yılları arasında yapılan 14 çalışma incelenmiş, triyaj hemşirelerine eğitim verildikten sonra bekleme sürelerinde anlamlı bir azalış (ortalama 37 dk.) olduğu tespit edilmiştir (37). Güney Afrika'da hasta yoğunluğu yüksek bir acil serviste, eğitimli hemşireler tarafından uygulanan triyajın bekleme süresine olumlu katkı sunduğu, beklemenin ortalama 38 dk. azaldığı bildirilmiştir (38).

Subash ve ark. (2004)'nin yaptıkları çalışmada, hekim ve hemşire iş birliğiyle yapılan triyajın tıbbî değerlendirme ve taburcu olma süresini azalttığını bildirmiştir (39). Sarıkaya ve ark. (2004)'nin hekim ve paramediklerin triyaj tutarlılıkları üzerine yaptıkları çalışmada, triyaj eğitiminden önce triyaj tutarlılıkları zayıf olarak tespit edilen hekim ve paramedikler, eğitim verildikten sonra triyaj tutarlılığında artış gözlemlendiği bildirilmiştir.

Sonuç

Yönetmelikte triyajı yapabilecek personeller; hekim, hemşire, paramedik ve sağlık personeli olarak tanımlanmış ama iş ayrımları ayrıntılı belirtilmemiştir. Sahada çoğunlukla normal triyaj alanında pratisyen ve uzman hekim triyaj yapmamaktadır. Sadece kırmızı alanda uzman hekim ambulansla gelen hastaya triyaj yapmaktadır. Yönetmelikte triyaj yapar kısmı açık uçlu bırakıldığı için kargaşaya neden

olmakta bu yüzden yeni bir yönetmelikle acil serviste görevli sağlık profesyonellerinin triyaj görevleri ayrıntılı belirtilmelidir. Ayrıca triyaj, uygulama kılavuzlarıyla uygulayıcılara sunulmalıdır.

Yapılan birçok çalışmada triyaj eğitimi almış hekim ve hemşirelerin yaptığı triyajın, bekleme süresi ve güvenilirliği açısından diğer sağlık profesyonellerine göre daha etkili olduğu gözlemlenmiştir. Lisans eğitiminde triyaj eğitiminin önemsenmesi, ilkyardım ve Acil Bakım dersi içeriğine triyaj eğitiminin eklenmesi, mezuniyet sonrası göreve başlayan hemşirelerin hizmet içi eğitimlerinde triyajdaki yenilikler hakkında düzenli bilgilendirilmesinin, eksikliklerin giderilmesinde ve daha başarılı triyaj uygulanmasında faydalı olacağı kanaatindeyiz.

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Etik Beyan: Yazarlar araştırma ve yayın etiğine uyduklarını beyan ederler.

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