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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Factors Affecting The Mortality of Patients Hospitalized in The Intensive Care Units from the Emergency Department

Acil Servisten Yoğun Bakım Ünitesine Yatırılan Hastaların Mortalitesini Etkileyen Faktörler

Öner Avınca[1], Mahmut Taş[1], Ömer Kaçmaz[1],Ömer Damar[1], Yenal Karakoç[1], Mehmet Serdar Yıldırım[1]

ABSTRACT

Aim: The objective of our study is to determine the effects of these data on mortality by examining the demographic and laboratory findings of patients hospitalized from the emergency service to the intensive care units.

Material and Methods: Our study was conducted with a retrospective examination of patients who were hospitalized in the Internal Diseases Intensive Care Unit from the Emergency Department between 01/09/2016 and 30/09/2017 after obtaining approval from the Ethics Committee of the SBU Diyarbakır Gazi Yaşargil Training and Research Hospital. Laboratory findings, hospitalization diagnoses and pre-existing diseases of the patients were examined during their admission to the emergency department.

Results: In our study, we examined 295 patients who were hospitalized in the Internal Diseases Intensive Care Unit of our hospital from the Emergency service between 01.09.2016 and 30.09.2017. 57.3% (n = 169) of our patients were female and 42.7% (n = 126) were male. The average age of our patients was calculated as 66.33 ± 20.24 years. The median length of stay in hospital was 6 days. In addition to the hospitalization diagnoses of our patients, 79.3% (n = 234) of our patients were found to have at least one disease previously diagnosed.

Conclusion: It is important to predict the mortality of patients in the ICU, to measure the severity of the diseases, to determine the factors affecting the mortality and length of stay of the patients, and to develop new treatment protocols. Analyzing the time spent in intensive care units will enable healthcare professionals to make better decisions and increase the quality of health care.

Keywords: Emergency service, intensive care, mortality factors

ÖZ

Amaç: Acil servisten yoğun bakım ünitelerine yatırılan hastaların demografik ve laboratuar bulgularını inceleyerek, bu verilerin mortalite üzerine etkilerini belirlemektir.

Gereç ve Yöntemler: Çalışma Sağlık Bilimleri Üniversitesi Diyarbakır Gazi Yaşargil Eğitim Araştırma Hastanesi etik kurulundan onay alındıktan sonra 01.09.2016-30.09.2017 tarihleri arasında acil servisten iç hastalıkları yoğun bakım ünitesine yatırılan hastaların geriye dönük incelemesi ile yapıldı. Hastaların acil servise başvuruları sırasında alınan laboratuvar değerleri ile yatış tanıları ve önceden var olan hastalıkları incelendi.

Bulgular: İç hastalıkları yoğun bakım ünitesine 01.09.2016-30.09.2017 tarihleri arasında acil servisten yatırılan 295 hastayı inceledik. Hastaların %57,3'ü (n=169) kadın, %42,7'si (n=126) erkekti. Yaş ortalamaları 66,33±20,24 olarak hesaplandı. Hastanede yatış süresi medyan olarak 6 gün hesaplandı. Hastaların yatış tanılarına ek olarak %79,3 (n=234) hastada daha öncesinden tanı almış en az bir hastalığın mevcut olduğu saptandı.

Sonuç: Yoğun bakım ünitesinde yatan hastaların mortalitelerinin ön görülmesi, hastalıkların ciddiyetinin ölçülmesi, hastaların mortalitelerine ve yatış sürelerine etki eden faktörlerin belirlenmesi, yeni tedavi protokollerinin geliştirilebilmesi açısından önemlidir. Yoğun bakım ünitesinde geçirilen zamanın analiz edilmesi sağlık çalışanlarının daha iyi karar almasını ve sağlık hizmeti kalitesinin artmasını sağlayacaktır.

Anahtar Kelimeler: Acil servis, yoğun bakım, mortalite faktörleri

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Giriş

Yoğun bakım üniteleri (YBÜ); yaşamı tehdit eden sağlık sorunları olan hastaların takip ve tedavi edildiği, gerektiğinde hayati fonksiyonların devamı için destek ünitelerinin kullanıldığı, sıkı gözlem ve hızlı müdahale için hasta başına düşen hemşire sayısının çok olduğu, yüksek teknolojik donanıma sahip özel tedavi birimleridir (1,2). Tedavinin pahalı ve yatak sayısının kısıtlı olması yoğun bakımdan fayda görebilecek hastaların dikkatle seçilmesini gerektirmektedir. YBÜ'nde yatmakta olan hastalarda mortaliteyi artıran faktörlerin belirlenmesi ve bunlara yönelik önlemlerin alınması mortaliteyi azaltacaktır. Çalışmalar göz önüne alındığında YBÜ'nde yatan hastaların mortalite oranlarının %20,5-%43 arasında değişmekte olduğu ve en sık ölüm sebepleri arasında sepsis, kardiyopulmoner arrest, pnömoni ve aritmilerin olduğu gözlemlenmiştir. Yoğun bakıma yatan hastalarının genel olarak yaşlı ve immun sistemi zayıflamış kişiler olmasının da mortalite oranlarını arttırmakta olduğu gözlemlenmiştir (3).

Çalışmamızda Sağlık Bilimleri Üniversitesi (SBÜ) Diyarbakır Gazi Yaşargil Eğitim ve Araştırma Hastanesi Acil Servisi'nden İç Hastalıkları Yoğun Bakım Ünitesi'ne yatırılan hastaları iki gruba ayırıp demografik ve laboratuar bulgularını inceleyerek gruplar arası prognoz ile ilişkisi olabilecek parametreleri belirlemeyi amaçladık**.**

Gereç ve Yöntem

Çalışma alanı ve popülasyon

Çalışma; SBÜ Diyarbakır Gazi Yaşargil Eğitim Araştırma Hastanesi etik kurulundan 02.03.2018/38 tarih ve sayı onayı alındıktan sonra 01.09.2016-30.09.2017 tarihleri arasında Acil Servis'ten İç Hastalıkları Yoğun Bakım Ünitesi'ne yatırılan 295 hastanın geriye dönük incelemesi ile yapıldı. Hastane bilgi işlem sistemi kullanılarak, Acil Servis'ten İç Hastalıkları Yoğun Bakım Kliniği'ne yatırılmış olan hastalar çalışmaya dahil edildi. Hastaların Acil Servis'e başvuruları sırasında alınan laboratuvar değerleri ile yatış tanıları ve önceden var olan hastalıkları incelendi. Tedavi ve takipleri sonucunda yoğun bakımdan taburcu edilenler grup 1, eksitus olanlar grup 2 olarak belirlendi.

Dışlama kriterleri

Hastane bilgi işlem sisteminden verilerine ulaşılamayan hastalar, diğer kliniklerden transfer edilerek yoğun bakıma alınan hastalar ile tedavisi tamamlanmadan bir başka hastaneye sevk edilen hastalar çalışma dışı bırakıldı.

İstatiksel Analiz

Analiz için SPSS programı kullanıldı. Öncelikle Shapiro-Wilk's testi yapılarak verilerin dağılımına bakıldı. Normal dağılım mevcut ise sürekli değişkenler için Student t testi, normal dağılım yoksa Man Whiney U testi kullanıldı. Kategorik veriler için ise Chi-square testi kullanıldı. Nicel değişkenler tablolarda ortalama±SS (Standart Sapma) ve medyan (Minimum/Maksimum) şeklinde gösterilirken kategorik değişkenler ise n (%) olarak gösterildi. Değişkenler %95 güven düzeyinde incelenmiş olup p değeri 0,05'ten küçük olanlar anlamlı kabul edildi.

Bulgular

Hastanemiz İç Hastalıkları Yoğun Bakım Ünitesi'ne 01.09.2016-30.09.2017 tarihleri arasında Acil Servis'ten yatırılan 295 hastayı çalışmamızda inceledik. Hastalarımızın %57,3'ü (n=169) kadın, %42,7'si (n=126) erkekti. Hastalarımızın yaş ortalaması 66,33±20,24 olarak hesaplandı. Hastanede yatış süresi medyan olarak 6 gün hesaplandı. Hastalarımızın yatış tanılarına ek olarak %79,3 (n=234) hastada daha öncesinden tanı almış en az bir hastalığın mevcut olduğu saptandı. Diabetes mellitus %35,3 (n=104) oranı ile bu hastalıklar arasında en sık görülen hastalık olarak kayıt altına alındı. Hastalar; taburcu edilen %77,6 (n=229) grup 1, eksitus olan %22,4 (n=66) grup 2 olmak üzere iki grup olarak çalışmaya alındı.

Grupları cinsiyet açısından değerlendirdiğimizde; 169 kadın hastanın %81,1'i (n=137) taburcu olan grupta, %19,9'u (n=32) eksitus olan grupta görüldü. 126 erkek hastanın %73'ü (n=92) grup 1'de, %27'si (n=34) grup 2'de tespit edildi. Yapılan istatistik değerlendirmede cinsiyet ile mortalite arasında anlamlı bir istatistik değere rastlanmadı (p=0,120).

Hastaları komorbidite bakımından incelediğimizde; Akut böbrek yetmezliği (ABY) ve Diabetes mellitus (DM) varlığı, mortalite açısından gruplar arasında istatistiksel olarak anlamlıydı (sırasıyla p=0,002, p=0,040). Kardiyovasküler hastalık (p=0,772), nörolojik hastalık (p=0,094) ve kronik akciğer hastalıklarının (p=0,632) varlığı, mortalite üzerine istatistiksel olarak anlamlı değildi. Hastaların cinsiyet ve ek hastalık bakımından mortalite ilişkili değerleri Tablo 1'de verildi.

Ek Hastalık	**Grup 1 (Taburcu edilenler)** n=229 (%77.6)	**Grup 2 (Eksitus olanlar)** n=66 (%22.4)	**P**
Akut Böbrek Yetmezliği	61 (%66,3)	31 (%33,7)	p=0,002
Diabetes Mellitus	88 (%84,6)	16 (%15,4)	p=0,040
Kardiovasküler Hastalık	79 (%76,7)	24 (%23,3)	p=0,772
Nörolojik Hastalık	18 (%64,3)	10 (%35,7)	p=0,094
Kronik Akciğer Hastalığı	20 (%74,1)	7 (%25,9)	p=0,632
Cinsiyet			
Erkek	92 (%73)	34 (%27)	p=0,120
Kadın	137 (%81,1)	32 (%18,9)	

Tablo 1. Gruplar arasında cinsiyet, yaş, ek hastalık bakımından mortalite ile ilişkili değerler

Hastaların yaş ortalaması grup 1'de 71 yaş (Min./Maks. 17/94**)**, grup 2'de 78 (Min./Maks. 51/105) olarak tespit edildi. Gruplar arası yaş ortalamaları istatistiksel olarak incelendiğinde anlamlı sonuç elde edildi (p<0,001).

Hasta grupları; yatış sürelerinin mortalite üzerine olan etkisi incelendiğinde, gruplar arası fark istatistiksel olarak anlamlı değildi (p=0,881).

Hastaların hastaneye yatışı sırasında başvuru anındaki laboratuvar değerlerinin ortalamalarının gruplar arası mortalite ile ilişiklileri incelendi. CRP grup 1'de 33,10mg/L (17mg/L-94mg/L), grup 2'de 88,35mg/L (0,20mg/L-526mg/L), Lenfosit sayısı grup 1'de 1,34010³/uL (0-9,810³/uL), grup 2' de 0,8510³/uL (0,12-4,9910³/uL), Üre grup 1'de 98mg/dL (6mg/dL-445mg/dL) grup 2'de 136mg/dL (2,36mg/dL-407mg/dL) tespit edildi. Gruplar arasında CRP, Lenfosit sayısı, Üre değeri mortalite açısından istatistiksel olarak anlamlıydı (p<0,001).

Laboratuvar değerlerinin guruplar arası mortalite ile ilişiklileri Tablo 2'de düzenlendi.

	Grup 1	**Grup 2**	
	Med. (Min./Maks.)	**Med. (Min./Maks.)**	**P**
Yaş (yıl)	71 (17/94)	78 (51/105)	p<0,001
Yatış süresi (gün)	7 (0/60)	4,5 (0/59)	p=0,881
CRP (mg/L)	33,10 (0,10/470)	88,35 (0,20/526)	p<0,001
WBC (10³/uL)	11,04 (0,38/38,18)	12,19 (0,31/44,49)	p=0,378
Nötrofil (10³/uL)	8,68 (0/81,60)	10,57 (0,6/27,90)	p=0,374
Lenfosit (mcL)	1,34 (0/9,8)	0,85 (0,12/4,99)	p<0,001
N/L oranı (10³/uL)	6,74 (0/111,78)	11,53 (0,28/71,47)	p=0,017
MPV (fL)	9,67 (,044/336)	9,82 (7/12)	p=0,249
Üre (mg/dL)	98 (6/445)	136 (2,36/407)	p<0,001
Kreatinin (mg/dL)	2,16 (0,16/221)	3,18 (0,39/13,42)	p=0,789
eGFR (ml/dk)	27 (3/90)	15,50 (3/90)	p<0,001
Glukoz (mg/dL)	148 (85/1154)	134 (29/1012)	p=0,951

CRP- C reactive protein, Lenf-Lenfosit, MPV–mean platelet volume, Neu-Nötrofil, NLR-Neutrophils lymphocytes ratio, WBC-white blood cell,

Tablo 2. Laboratuvar değerlerinin guruplar arası mortalite ile ilişkisi.

Tartışma

Yoğun bakım üniteleri hastanelerde mortalite oranlarının en yüksek olduğu bölümler olarak bilinmektedir (3,4). Mortaliteyi etkileyen nedenlerin bilinmesi; Hekimler için hastalığın ciddiyetini anlamada ve gerekli önlemleri almada önemli bir durumdur. YBÜ'ndeki hastaların değerlendirilmesinde Akut Fizyoloji ve Kronik Sağlık Değerlendirmesi (Acute Physiology and Chronic Health Evaluation: APACHE), Mortalite Tahmin Modeli (Mortality Prediction Model: MPM), Çoklu Organ Yetmezliği Skoru (Organ Dysfunction Score: MODS) ve Ardışık Organ Yetmezliği Değerlendirme Skoru (Sequential Organ Failure Assessment Score: SOFA) gibi skorlama sistemleri kullanılmaktadır. Fizyolojik ölçümlerin kullanıldığı bu skorlar, hastalığın seyri ve mortalite ile paralellik gösterir (2). Biz bu çalışmada YBÜ'nde mortaliteye etki edebilecek hastaların demografik verilerini ve laboratuvar parametrelerini inceledik. Çalışmamızda mortalite oranı %22,4 (n=66) idi ve bu oran literatürdeki diğer çalışmalar ile benzerdi (3). YBÜ'nde mortalite oranlarını etkileyen faktörlerden biri de yaştır. Furchs ve arkadaşlarının çalışmasında 75 yaş üstünde mortalitenin arttığı ve yaşın mortaliteyi belirlemede bağımsız risk faktörü olduğu bildirilmiştir (5). Öte yandan yaşın mortalite üzerine etkisi olmadığını savunan yayınlar da mevcuttur (6,7). Bizim çalışmamızda ex vakalarının yaş ortalaması taburcu olan hastalara oranla istatistiksel olarak daha yüksekti (p<0,001).

YBÜ'lerde yatak imkânlarının sınırlı olmasından dolayı yatış süresi oldukça önemlidir. Sticker ve arkadaşlarının yaptıkları çalışma YBÜ'nde yatan hastaların yalnızca %11'inin bir haftadan daha fazla kaldığını göstermiştir (8). Fakhry iki haftadan fazla YBÜ'nde kalan hastaların fonksiyonel iyileşmelerinin %50'den daha az olduğunu ve bu hastaların ancak yarısından azının hayata dönebildiğini belirtmiştir (9). Bazı çalışmalarda YBÜ'nde iki haftadan uzun süreli yatışlarda hasta mortalitesinin %50'lere ulaşabildiği görülmüştür (10). Bizim çalışmamızda exitus olan hastaların YBÜ'nde yatış süresi ortalama 4,5 gün (0/59) iken sağlıklı bir şekilde taburcu olanlarda 7 gün (0/60) saptanmıştır. Çalışmamız diğer çalışmaların aksine eksitus süresi daha kısa bulunmuştur. Başvuru anında komorbiditesi yüksek olan, hastane başvurusu geciken vakaların daha erken eksitus olduğu görülmüştür.

Yapılmış olan birçok çalışmada; yaşlılarda YBÜ'ye yatış nedenleri sıralandığında kardiyovasküler hastalıkların çoğunlukta olduğu gözlemlenmiş olup (11,12), bizim çalışmamızda da hastaneye yatışlar arasında ilk sırada kardiyovasküler hastalıklar bulunduğu görüldü.

Yoğun bakıma yatırılan hastalarda mevcut olan veya yeni meydana gelen böbrek hasarı hastaların mortalite oranlarını etkilemektedir. Bu hastalarda sıvı kaybı, hipotansiyon, sepsis, rabdomiyoliz gibi durumlar böbrek hasarına yol açmaktadır. Hastaların akut böbrek yetmezliğine girmesi ya da kronik böbrek yetmezliği olan hastalarda böbrek fonksiyonlarının kötüleşmesi de mortaliteyi artırmaktadır (13). Bizim çalışmamızda diğer çalışmalara benzer şekilde, laboratuar parametrelerinden üre değeri, YBÜ'nde eksitus olan hastalarda daha yüksek oranda tespit edildi (p<0,001).

Sonuç

Yoğun bakıma yatış ve mortalite ile ilgili olarak yapılmış birçok çalışma mevcuttur. Her çalışmada farklı sonuçlar çıkmaktadır. Çünkü her çalışmanın yapıldığı bölgede hasta karakteristiği farklı olduğu gibi bireysel değerlendirme de etkin olmaktadır. Skorlama sistemleri değerli araçlardır, fakat potansiyel tesadüfi ve sistematik hatalarla doludur. Hastaları nasıl, ne zaman ve kimin değerlendirdiği detayları çok önemlidir (14).

Bizim çalışmamızda YBÜ'nde yatan hastalarda yaş değeri, CRP, lenfosit, üre gibi laboratuvar bulguları ve ABY, DM gibi

ek hastalıkların varlığının mortaliteyi arttırdığı gözlemlenmiştir.

YBÜ'de yatan hastaların mortalitelerinin tahmin edilmesi, hastalık ciddiyetlerinin ölçülmesi, hastanın mortalitesine ve yatış süresine etki eden faktörlerin belirlenmesi yeni tedavi yöntemleri ve politikaları geliştirilebilmesi açısından önemlidir. Yoğun bakım ünitelerinde yaşanan süreçlerin analiz edilmesi hekimlerin daha net kararlar almasını ve sağlık hizmet sunumunda kalitenin artmasını sağlayacaktır.

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Yazarlar yayın ve araştırma etik kurallarını takip ettiğini beyan etmektedir.

Kaynaklar

1- Walter KL, Siegler M, Hall JB. How decisions are made to admit patientst medica lintensive care units: A survey of MICU directors at academic medical centers across the United States. Crit Care Med 2008; 36: 414-20.
2- Uysal N, Gündoğdu N, Börekçi Ş, et al. Üçüncü Basamak Merkezde Dâhili Yoğun Bakım Hastalarının Prognozu. Yoğun Bakım Derg 2010; 1: 1-5.
3- Akkoç İ, Yücetaş E, İşitemiz İ et al. Üçüncü Basamak Sağlık Kurumunda Yoğun Bakım Ünitesindeki Hastalarda Mortalite Oranları Ve İlişkili Faktörlerin Belirlenmesi: 3945 Hastanın analizi. Bezmialem Science 2017; 5: 116-20 DOI:10.14235/bs.2017.1102.
4- Uçgun İ, Metintaş M, Moral M et al. Malign patolojisi olmayan solunum yoğun bakım hastalarında mortalite hızı ve yüksek riskli hastaların belirlenmesi. Toraks Dergisi 2003; 4:151-60.
5- Fuchs L, Chronaki CE, Park S, et al. ICU admission characteristics and mortality rates among elderly and very elderly patients. Intensive Care Med 2012; 38:1654-61.
6- Knaus WA, Draper EA, Wagner DP. APACHE II: A severity of disease classification system. Crit Care Med 1985; 13: 818-29.
7- Sacanella E, Perez-Castejon JM, Nicolas JM, et al. Mortality in healthy elderly patients after ICU admission. Intensive Care Med 2009; 35: 550-5.
8- Stricker K, Rothen HU, Takala J. Resource use in the ICU: short- vs long-term patients. Acta Anaesthesiol Scand 2003; 47: 508-515.
9- Fakhry SM, Kercher KW, Rutledge R. Survival, quality of life, and changes in critically ill surgical patients requiring prolonged ICU stays. J Trauma 1996; 41: 999-1007.
10- Ryan TA, Rady MY, Bashour CA et al. Predictors of outcome in cardiac surgical patients with prolonged intensive care stay. Chest 1997; 112: 1035-1042.
11- Fuchs L, Chronaki CE, Park S, et al. ICU admission characteristics and mortality rates amon gelderly and very elderly patients. Intensive Care Med 2012;38:1654-61.
12- Bagshaw SM, Webb SA, Delaney A, et al. Very old patients admitted to intensive care in Australia and New Zealand: a multi-centre cohort analysis. Crit Care 2009;13:45.
13- Akın S, Gündoğan K, Coşkun R, et al. Yoğun Bakımda Yaşlı Hasta Mortalitesi: Yaş Risk Faktörü Mü? Yoğun Bakım Derg 2014; 5: 26-9
14- Margeret SH. Pulmonary and Critical Care Medicine, University Health Network, Assistant Professor of Medicine; Clinics in Chest Medicine 2003;24: 751-62.

ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Comparison of WBC / MPV Ratio with the Well's Score in Patients with Pulmonary Embolism at Emergency Department

Acil Serviste Pulmoner Emboli Tanılı Hastalarda WBC/MPV Oranının Well's Skoru ile Karşılaştırılması

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ABSTRACT

Aim: This study aims to compare the WBC / MPV ratio with the Wells clinical probability score in patients admitted to the emergency department with the suspicion of Pulmonary Embolism (PE) and to investigate whether this ratio can be used as a marker in determining prognosis.

Material and Methods: A total of 111 patients who presented to the emergency department between 01 September 2019 and 31 August 2020 and met the criteria were included in the study. The Well's score was used to evaluate patients' clinical probability of PE. According to the Wells scores, patients were divided into 3 as low, moderate and high-risk groups. In addition, the WBC / MPV ratio (WMR) obtained from the patients' first admission hemograms were calculated.

Results: The median age of the patients in the study was 65 (IQR 25-75: 57-79). 56 of the patients (50.5%) were female and PE was detected in 68 (61.3%). It was observed that the mean WBC level was significantly different in the group with PE ($p < 0.05$). There was no statistically significant difference between MPV and WMR levels with PE groups. There was no statistically significant difference between the mean WBC, MPV, and WMR levels with the 28-day mortality. Additionally, there was no statistically significant difference between the Wells scores of the patients in the low, moderate and high-risk groups with WBC, MPV and WMR levels. In Pearson correlation analysis, there was no relationship between WBC, MPV and WMR levels with the Well's scores.

Conclusion: It was found that the WMR value, a simple, cheap and accessible test, is insufficient to predict the 28-day mortality in patients with PE. No correlation was identified between WMR values and Wells scores. WBC elevation was found to be significantly higher in those with a diagnosis of PE. It was determined that the use of WMR as a pre-test in the diagnosis of PE is not beneficial.

Keywords: Emergency department, pulmonary embolism, Wells score, mortality, D-dimer

ÖZ

Amaç: Bu çalışmanın amacı acil servise Pulmoner Emboli (PE) şüphesi ile başvuran olgularda WBC/MPV oranın Wells klinik olasılık skoru ile karşılaştırmak ve prognozu belirlemede bir belirteç olarak kullanılıp kullanılamayacağını araştırmaktır.

Gereç ve Yöntemler: 01 Eylül 2019 ile 31 Ağustos 2020 arasında acil servise başvuran ve kriterleri karşılayan toplam 111 hasta çalışmaya dâhil edildi. Hastaların PE klinik olasılık değerlendirilmesi için Wells skoru kullanıldı. Wells skorunda ise hastalar düşük, orta ve yüksek riskli olarak 3 gruba ayrıldı. Ayrıca hastaların ilk başvuru hemogramlarından elde edilen WBC/ MPV oranı (WMO) hesaplandı.

Bulgular: Çalışmaya dâhil edilen hastaların ortanca yaşı 65 (IQR 25-75: 57-79) yıldı. Hastaların 56'sı (%50.5) kadın olup, 68'inde (%61.3) PE saptandı. Ortalama WBC düzeyinin PE tanılı grupta anlamlı derecede farklı olduğu görüldü ($p<0.05$). MPV ve WMO düzeyleri ile PE grupları arasında istatistiksel olarak anlamlı bir fark bulunamadı. Ortalama WBC, MPV ve WMO düzeyleri ile 28 günlük mortalite arasında istatistiksel olarak anlamlı bir fark bulunamadı. Düşük, orta ve yüksek riskli Wells skorları ile WBC, MPV ve WMO düzeyleri arasında istatistiksel olarak anlamlı bir fark saptanmadı. Pearson korelasyon analizinde WBC, MPV ve WMO düzeyleri ile Wells skor değerleri arasında bir korelasyon saptanmadı.

Sonuç: Basit, ucuz ve ulaşılabilir bir test olan WMO değerinin, PE'li hastalarda 28 günlük mortaliteyi öngörmede yetersiz olduğunu saptadık. WMO değerleri ile Wells skorları arasında bir korelasyon saptayamadık. WBC yüksekliği PE tanısı olanlarda anlamlı olarak yüksek bulundu. WMO'nun PE tanısında ön test olarak kullanımının faydalı olmadığı tespit edildi.

Anahtar Kelimeler: Acil servis, pulmoner emboli, Well's skoru, mortalite, D-dimer

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Introduction

Pulmonary embolism (PE) is an acute and life-threatening disease. PE can occur as a complete or partial occlusion of the pulmonary artery or its branches with a clot (air, tumor, fat) originating from elsewhere in the body. In epidemiological studies, annual incidence rates for PE vary between 39 and 115 per 100,000 (1). There should be a clinical suspicion for the diagnosis of PE. There is no specific laboratory test. The most commonly used laboratory test is D-dimer. The sensitivity and negative predictive value (NPV) of D-dimer is high, whereas its specificity and positive predictive value (PPV) are low. Due to the simultaneous activation of coagulation and fibrinolysis, D-dimer levels in plasma increase in the presence of acute thrombosis. While a normal D-dimer level eliminates the possibility of acute PE or DVT, the PPV of an elevated D-dimer level is low. Thus, the D-dimer test is not useful for confirming PE(2). Various risk scores to help the diagnosis of PE have been developed (Pulmonary Embolism Rule out Criteria [PERC], the Well's Score and Geneva Score) (3, 4).Leukocytes (White blood cell (WBC)) mediate inflammation, cause proteolytic and oxidative damage to endothelial cells, clog micro vessels, and induce hyper coagulability. Since leukocytes are larger than red blood cells and thrombocytes, they migrate to the microvascular damaged area following necrotic damage in diseases with acute ischemia, trigger ischemia, and enlarge the infarct area by occluding the tiny vessels (5).

Among the hemogram parameters, the mean platelet volume (MPV) is a parameter that is particularly used in the follow-up of inflammation. MPV indicates the size of platelets and is associated with platelet function and activation. MPV increases with the elevation in the diameter of thrombocytes. New platelet synthesis occurs in the bone marrow. Thus, platelets become more functional, younger, and larger; MPV increase is detected. There are many studies regarding the role of MPV in carrying important information in cardiovascular diseases and in inflammation. High MPV increases the risk of stroke as well as coronary artery disease (CAD) (6-8).

This study aims to investigate whether WBC / MPV level can be used as a marker in determining prognosis and whether there is a relationship between WBC / MPV level with the Well's and other scoring.

Material and Methods

This single-center, prospective, cross-sectional, and descriptive case study was conducted in the Emergency Department of University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital between 01.09.2019 and 31.08.2020. The approval was obtained from the Clinical Research Ethics Committee of the aforementioned hospital with the protocol number 2011-KAEK-25 2019 / 10-09. Patients who were over 18, had Computed Thoracic Tomography (CTTA) and signed a consent form were included in the study. Patients with a history of pregnancy, those under the age of 18, those who did not sign a consent form, and those who could not undergo CTTA due to various reasons (such as allergy, chronic kidney disease, etc.) were excluded.

A total of 131 patients participated in the study. 6 were excluded due to pregnancy and 14 were excluded as CT angiography could not be performed. To sum up, a total of 111 patients who met the criteria were included.

According to the information obtained from the patients presenting to the emergency department with the suspicion of PE, the complaints during admission, age, gender, vital signs, comorbidities, and ECG findings were recorded. The Well's score was used for the clinical probability assessment of PE. Patients were divided into 3 as low, moderate and high risk groups according to the Well's score. When D-dimer levels were high in patients in low and moderate risk groups, CT angiography was performed for the definitive diagnosis. In the high-risk group, CTTA was performed regardless of D-dimer levels. In addition, WMR was calculated from the ratio of WBC and MPV values obtained from the first admission hemograms of the patients.

Statistical Analysis

IBM SPSS Statistics for Windows, Version21.0 (IBM Corp. Armonk, NY: USA. Released 2012) package program was used for statistical analysis. In descriptive statistics, the categorical variables were expressed as the number of cases and percentage (%), while the numerical variables were expressed as mean ± standard deviation (minimum - maximum), median and range and / or interquartile range (IQR). Kolmogorov-Smirnov test was used for the normality distribution of the data. Whether the assumption of homogeneity of variances was achieved was investigated by Levene's test. The significance of the difference between the groups in terms of continuous numerical variables where parametric test statistics assumptions were met was examined with Student's t test, whereas the significance of the difference in terms of continuous numerical variables where parametric test statistics assumptions were not met was evaluated with the Mann Whitney U test. One-Way ANOVA test was used to compare three or more normally distributed groups. Pearson correlation analysis was also used to evaluate the relationships between variables showing parametric distribution. Chi-square and Fisher's exact test were used to analyze whether there was a relationship between categorical variables. $p < 0.05$ was considered statistically significant.

Results

A total of 111 patients were included in the study. The median age of the patients was 65 (IQR 25-75: 57-79) and 56 (50.5%) of them were females. PE was found in 68 (61.3%) of the patients, while it was not detected in 43 (38.7%). The median systolic blood pressure (SBP) of the patients was 128 mm / Hg (IQR 25-75: 110-140) and the median heart rate was 100 / minute (IQR 25-75: 88-112). The mean WBC value of the patients was found to be 10.64 ± 4.22, the mean MPV value as 9.72 ± 1.30 and the mean WMR value as 1.11 ± 0.46. The clinical and laboratory findings of the patients are shown in Table 1.

Variables	Total	PE (+)	PE(-)
Age, median (IQR25-75)	65 (57-79)	70 (57.25-80)	63 (51-73)
GCS, median (IQR25-75)	15 (15-15)	15 (15-15)	15 (15-15)
CBP,median (IQR25-75)	128 (110-140)	120 (110-136,75)	130 (116-151)
DBP, median (IQR25-75)	80 (70-86)	80 (70-80)	80 (70-91)
Pulse, median (IQR25-75)	100 (88-112)	102,50 (90-113,50)	96 (84-112)
SPO_2 median (IQR25-75)	94 (90-97)	94 (88-97)	95 (90-97)
Respiratory Rate, median (IQR25-75)	18 (16-20)	17 (15-20)	18 (16-20)
Shock index, mean ± (Std dv)	0,88 ± 0,53	0,95 ± 0,39	0,76 ± 26
Fever, mean ± (Std dv)	36,56 ± 0,57	36,56 ± 0,52	36,54 ± 0,65
D-dimer, mean ± (Std dv)	11,70 ± 16,73	13,56 ± 18,03	8,765 ± 2,65
WBC, mean ± (Std dv)	10,64 ± 4,22	11,30 ± 4,10	9,61 ± 8,98
MPV, mean ± (Std dv)	9,72 ± 1,30	9,77 ± 1,17	9,65 ± 9,40
WMR, mean ± (Std dv)	1,11 ± 0,46	1,17 ± 0,46	1,01 ± 1,02
pH, mean ± (Std dv)	7,38 ± 0,08	7,37 ± 0,06	7,393 ± 7,39
Lactate, mean ± (Std dv)	2,29 ± 1,79	2,39 ± 1,76	2,13 ± 1,40
Troponin, mean ± (Std dv)	56,92 ± 100,32	60,81 ± 102,52	50,76 ± 12,79

GKS: Glaskow Coma Scale, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure SPO2: Finger Tip Oxygen Saturation

Table 1. Clinical and Laboratory Variables

The most common complaint of patients presenting to the emergency department was dyspnea in 57 (51.4%). Additionally, the most common complaint was found to be dyspnea in patients diagnosed with PE. 96 (86.5%) of the patients had a history of comorbidities. In the Well's scoring of the patients, it was observed that 52.3% of the patients had a moderate risk. Additionally, of patients diagnosed with PE, 54.4% had a moderate risk. Mortality was seen in 8 (7.2%) of the patients within a period of 28 days. Moreover, mortality occurred in 7 (10.3%) of the patients with a diagnosis of PE within a period of 28 days (Table 2.)

The Independent Samples T test was performed to investigate whether there was a difference between WBC, MPV and WMR levels with PE diagnosis and 28-day mortality. As a result of this test, it was seen that the mean WBC level was significantly different in the group with PE ($p < 0.05$). No statistically significant difference was found between MPV and WMR levels with PE diagnosis. In addition there was no statistically significant difference between WBC, MPV and WMR levels with 28-day mortality ($p > 0.05$) (Table 3).

In the One-Way ANOVA test conducted to see whether there was a significant difference between low, moderate and high risk Well's scores with WBC, MPV and WMR levels, no statistically significant difference was found between the groups ($p > 0.05$) (Table 4).

In the Pearson correlation analysis conducted to determine whether there was a relationship between WBC, MPV and WMR levels with the Well's scores, no correlation was found between WBC, MPV and WMR levels with the Well's scores ($p > 0.05$) (Table 5).

Discussion

PE is a disease with high morbidity and mortality. As there are no clinical and physical examination findings specific to the disease, clinicians may experience difficulties in the diagnosis and treatment phase. Therefore, rapid diagnosis and treatment is vital in patients with clinical suspicion of PE in emergency departments.

PE is more common in middle-aged and female population. In a study by Keller et al., the mean age was found to be 68.5 ± 15.3 years and the rate of women was 61.5% (9). Similarly, in a study conducted by Hassine et al., the mean age was found to be 58 and the rate of females was 53%(10). Additionally, in a study conducted in our country by Mangal et al. the mean age was determined to be 68.54 and the rate of females was 65.1% (11).In our study, the median age of patients diagnosed with PE was 70, and the rate of the female population was also relatively high. These findings are consistent with the results of studies in the literature. PE has atypical clinical signs and symptoms.

Variables		Total n (%)	PE(+) n(%)	PE(-) n(%)
Admissions complaints	Dyspnea	57 (51,4)	46 (67,6)	11(25,6)
	Chest Pain	23 (20,7)	11 (16,2)	12 (27,8)
	Syncope	1 (0,9)	1 (1,5)	0 (0)
	Palpitation	10 (9)	6 (8,8)	4 (9,3)
	Other	20 (18)	4 (5,9)	16 (37,3)
Comorbidities	No	15 (13,5)	6 (8,8)	9 (20,9)
	Yes	96 (86,5)	62 (91,2)	34 (79,1)
HT	No	66 (59,5)	40 (58,8)	26 (60,5)
	Yes	45 (40,5)	28 (41,2)	17 (39,5)
DM	No	94 (84,7)	58 (85,3)	36 (83,7)
	Yes	17 (15,3)	10 (14,7)	7 (16,3)
COPD / Asthma	No	91 (82)	57 (83,8)	34 (79,1)
	Yes	20 (18)	11(16,2)	9 (20,9)
CAD	No	76 (68,5)	52 (76,5)	23 (53,5)
	Yes	35 (31,5)	16 (23,5)	20 (45,5)
Malignancy	No	94 (84,7)	59 (86,8)	35 (81,4)
	Yes	17 (15,3)	9 (13,2)	8 (18,6)
CVD	No	96 (86,5)	59 (86,8)	37 (86)
	Yes	15 (13,5)	9 (13,2)	6 (14)
Other	No	107 (96,4)	64 (94,1)	43 (100)
	Yes	4 (3,6)	4 (5,9)	0 (0)
Normal sinus rythm	No	57 (51,4)	37 (54,4)	20 (46,5)
	Yes	54 (48,6)	31 (45,6)	23 (53,5)
Sinus Tachycardia	No	76 (68,5)	46 (67,6)	30 (69,8)
	Yes	35 (31,5)	22 (32,4)	13 (30,2)
AF	No	100 (90,1)	61 (89,7)	39 (90,7)
	Yes	11 (9,9)	7 (10,3)	4 (9,3)
Right Bundle Branch Block	No	102 (91,9)	61 (89,7)	41 (95,3)
	Yes	9 (8,1)	7 (10,3)	2 (4,7)
S1Q3T3	No	101 (91)	61 (89,7)	40 (93)
	Yes	10 (9)	7 (10,3)	3 (7)
Other	No	105 (94,6)	64 (94,1)	41 (95,3)
	Yes	6 (5,4)	4 (5,9)	2 (4,7)
The Wells Risk Scoring	0-1 Low	45 (40,5)	23 (33,8)	22 (51,2)
	2-6 Moderate	58 (52,3)	37 (54,4)	21 (48,8)
	6<High	8 (7,2)	8 (11,8)	0 (0)
Status	Ex	3 (2,7)	2 (2,9)	1 (2,3)
	Leaving without permission	1 (0,9)	1 (1,5)	0 (0)
	Hospitalization	79 (71,2)	57 (83,8)	22 (51,2)
	Dispatch	6 (5,4)	6 (8,8)	0 (0)
	Discharge	16 (14,4)	0 (0)	16 (37,2)
	İntensive care	6 (5,4)	2 (2,9)	4 (9,3)
28-Day Mortality	No	103 (92,8)	61 (89,7)	42 (97,7)
	Yes	8 (7,2)	7 (10,3)	1 (2,3)
Total		**111 (100)**	**68 (100)**	**43 (100)**

PE: Pulmonary Embolism, HT: Hypertension, DM: Diabetes Melitus, COPD: Chronic Obstructive Pulmonary Disease, CAD: Coronary Artery Disease, CVD: Cerebrovascular Disease, AF: Atrial Fibrillation

Table 2. Clinical Findings of Variables

In a study by Yoon et al., The most common symptoms were dyspnea (63.7%) and chest pain (19.9%) (12).In another study conducted by Pollack et al. with 1880 patients, it was found that the two most common symptoms were dyspnea and pleuritic chest pain (13).

		Variables	n	Mean	SD	Independent Samples Test
Pulmonary Embolism	No	WBC	43	9,61	4,25	p<0.05
	Yes		68	11,3	4,1	
	No	MPV	43	9,65	1,5	p>0.05
	Yes		68	9,77	1,17	
	No	WMO	43	1,01	0,44	p>0.05
	Yes		68	1,17	0,47	
28-Day Mortality	No	WBC	103	10,61	4,24	p>0.05
	Yes		8	11,13	4,18	
	No	MPV	103	9,68	1,29	p>0.05
	Yes		8	10,33	1,43	
	No	WMO	103	1,12	0,48	p>0.05
	Yes		8	1,09	0,41	

WBC: White Blood Cell, MPV: Mean Platelet Volume, WMR: WBC/MPV Ratio

Table 3. Pulmonary Embolism and 28-Day Mortality Analysis of Variables

In a study conducted in our country by Acar et al., it was found that the most common symptoms were dyspnea and chest pain (14). Similarly in our study, the most common symptoms observed in patients were dyspnea and chest pain. These findings are also consistent with the literature.

PE is an acute emergency with high mortality and morbidity rates. In the study conducted by Tanabe et al., the 30-day mortality was found to be 6.1%. In another study by Dahhan et al., this rate was found to be 20.2% (15, 16). In a multi-center study conducted by Pollack et al., in-hospital 30-day mortality rate in patients with PE was found to be 3.4% (13). In the study conducted by Jimenez et al., the 30-day mortality rate was found to be 5.7% (17). In another study conducted by Hajizadeh et al., in-hospital short-term mortality rates of patients with PE were found to be 9.3% (18). In our study, the 28-day mortality rate was found to be 10.3%. This rate is consistent with the other publications in the literature.

					95% Confidence Interval		
	The Well's Risk	n	Mean	SD	Lower Limit	Upper Limit	One-Way ANOVA Test
WBC	Low	45	10,4	4,46	9,06	11,74	p>0.05
	Moderate	58	10,9	4,15	9,8	11,98	
	High	8	10,28	3,75	7,15	13,41	
MPV	Low	45	9,65	1,3	9,26	10,03	p>0.05
	Moderate	58	9,73	1,37	9,37	10,1	
	High	8	10,14	0,85	9,43	10,85	
WMO	Low	45	1,11	0,52	0,95	1,26	p>0.05
	Moderate	58	1,13	0,42	1,02	1,24	
	High	8	1,03	0,42	0,68	1,38	
Total		111	1,11	0,46	1,03	1,2	

WBC: White Blood Cell, MPV: Mean Platelet Volume, WMR: WBC/MPV Ratio

Table 4. Analysis of Variables with the Well's Score

Clinical probability calculation scores were developed by combining symptoms, signs and history characteristics in patients with PE. The most commonly used clinical prediction rule was proposed by Well's et al. (19). In the study by Wong et al., the sensitivity of the Well's score was found to be 46.7% and the specificity was 62% (20). In the study of Martinez et al., the sensitivity of the Well's score was found to be 65% and the specificity was 81% (21). In our study, the moderate risk (52.3%) was found to be the most common in the Well's scoring of the patients. Additionally, 63.8% of the patients with moderate risk were diagnosed with PE. In the high risk group, PE was detected in all 8 patients (100%) while this rate was 51.1% in the low-risk group. Our study supports the effectiveness of Well's scores in showing the presence of PE. Accordingly, clinical findings and risk scoring systems should be carefully examined before performing invasive tests for diagnostic purposes.

WBC and MPV are the hemogram parameters that are quickly accessible in the emergency departments.

		WBC	MPV	WMR	The Wells Score
WBC	r	1	0,005	,935**	0,11
	p		0,957	0	0,249
MPV	r	0,005	1	-,325**	0,151
	p	0,957		0,001	0,113
WMO	r	,935**	-,325**	1	0,046
	p	0	0,001		0,633
The Well's Score	r	0,11	0,151	0,046	1
	p	0,249	0,113	0,633	

WBC: White Blood Cell, MPV: Mean Platelet Volume, WMR: WBC/MPV Ratio

Table 5. Pearson's Correlation Analysis of the Variables

The leukocyte increase in PE was first shown by Afzal et al. They stated that neutrophils particularly play an important role in the inflammatory response in the atherosclerotic background. Leukocytes are associated with both thrombogenesis and increased levels of fibrinogen, factor VII, factor VIII (22).

In recent studies, the relationship between WBC and MPV has been examined and the WBC / MPV ratio has been called as WMR. In studies with NSTEMI and STEMI patients, the relationship between WBC / MPV with major adverse cardiac events and long-term mortality has been observed to be stronger than other hematological parameters, which has recently attracted more attention (23, 24). In a retrospective study by Cannon et al., it was found that WBC above 10,000 increased mortality in AMI and UA patients (25).According to the study conducted by Hilal E. et al., there was no significant difference between MPV values of the study and control groups(26). In the study by Kostrubiec et al., there was no difference in MPV values between the groups with and without acute PE(27). According to the study by Çavuş et al., the high WBC values were found to be higher in the PE group than the control group, and it was shown that this value was the highest value in the study in those who could not survive after the disease (28).

There was no significant difference between the MPV and WMR values with the presence of PE in our study. However, WBC values were found to be significantly higher in patients with PE. In this study, it was found that the WBC, MPV and WMR values of the patients were not statistically significant in predicting 28-day mortality. Additionally, there was no statistically significant relationship between low, moderate and high risk well's scores with WBC, MPV and WMR levels of the patients.

The relatively low number of patients is the main limitation of this study. In addition, the COVID-19 pandemic was still ongoing during the study. We think that changes in complete blood count parameters in COVID-19 patients may have affected the study data and findings. The diagnosis of PE may also be overlooked due to similar symptoms and radiological and laboratory findings seen in COVID-19 patients.

As a result, we found that the WMR value obtained from the hemogram, which is a simple, cheap and accessible test, was insufficient to predict the 28-day mortality in patients with PE. We could not find a correlation between WMR values and well's scores. WBC elevation was found to be significantly higher in those diagnosed with PE. However, using WMR as a pre-test in the diagnosis of PE was not statistically significant.

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Authors' Contribution: All authors contrubuted 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.

References

1. Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS): The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). Eur Respir J. 2019;54(3): 1901647.
2. Righini M, Le Gal G, De Lucia S , et al. Clinical usefulness of D-dimer testing in cancer patients with suspected pulmonary embolism. Thromb Haemost. 2006;95(4):715-9.
3. Penaloza A, Verschuren F, Meyer G, et al. Comparison of the unstructured clinician gestalt, the wells score, and the revised Geneva score to estimate pretest probability for suspected pulmonary embolism. Ann Emerg Med. 2013;62(2):117-24.e2.
4. Kline JA. Diagnosis and Exclusion of Pulmonary Embolism. Thromb Res. 2018;163:207-20.
5. Engler RL, Schmid-Schönbein GW, Pavelec RS. Leukocyte capillary plugging in myocardial ischemia and reperfusion in the dog. Am J Pathol. 1983;111(1):98-111.
6. Cimminiello C, Toschi V. Atherothrombosis: the role of platelets. Eur Heart J.supplements. 1999;1(A):A8-A13.
7. Slavka G, Perkmann T, Haslacher H, et al. Mean platelet volume may represent a predictive parameter for overall vascular mortality and ischemic heart disease. Arterioscler Thromb Vasc Biol. 2011;31(5):1215-8.
8. Huczek Z, Kochman J, Filipiak KJ, et al. Mean platelet volume on admission predicts impaired reperfusion and long-term mortality in acute myocardial infarction treated with primary percutaneous coronary intervention. J Am Coll Cardiol. 2005;46(2):284-90.

9. Keller K, Beule J, Balzer JO, Dippold W. Typical symptoms for prediction of outcome and risk stratification in acute pulmonary embolism. Int Angiol. 2016;35(2):184-91.
10. Hassine M, Touil H, Massoued MB, et al. Correlation between acute pulmonary embolism severity index (PESI) and prognostic of acute pulmonary embolism. Arch Cardiovasc Dis Suppl. 2019;11(1):e293.
11. Mangal G, Eroğlu SE, Aksel G,et al. Akut pulmoner emboli hastalarında troponin değerlerinin prognoza etkisi. Anatolian Journal of Emergency Medicine. 2019;2(1):7-12.
12. Yoon YH, Lee SW, Jung DM,et al. The additional use of end-tidal alveolar dead space fraction following D-dimer test to improve diagnostic accuracy for pulmonary embolism in the emergency department. Emerg Med J. 2010;27(9):663-7.
13. Pollack CV, Schreiber D, Goldhaber SZ, et al. Clinical characteristics, management, and outcomes of patients diagnosed with acute pulmonary embolism in the emergency department: initial report of EMPEROR (Multicenter Emergency Medicine Pulmonary Embolism in the Real World Registry). J Am Coll Cardiol. 2011;57(6):700-6.
14. Acar H, Yılmaz S, Yaka E, et al. Evaluation of the Diagnostic Role of Bedside Lung Ultrasonography in Patients with Suspected Pulmonary Embolism in the Emergency Department. Balkan Med J. 2017;34(4):356-61.
15. Tanabe Y, Obayashi T, Yamamoto T, et al. Predictive value of biomarkers for the prognosis of acute pulmonary embolism in Japanese patients: Results of the Tokyo CCU Network registry. J Cardiol. 2015;66(6):460-5.
16. Dahhan T, Siddiqui I, Tapson VF, et al. Clinical and echocardiographic predictors of mortality in acute pulmonary embolism. Cardiovasc Ultrasound. 2016;14(1):44.
17. Jiménez D, Yusen RD. Prognostic models for selecting patients with acute pulmonary embolism for initial outpatient therapy. Curr Opin Pulm Med. 2008;14(5):414-21.
18. Hajizadeh R, Ghaffari S, Rajebi H, et al. Short-term mortality of patients with saddle pulmonary embolism: A single-center study. Turk Kardiyol Dern Ars.2019;47(4):273-80.
19. Wells PS, Anderson DR, Rodger M, , et al. Derivation of a simple clinical model to categorize patients probability of pulmonary embolism: increasing the models utility with the SimpliRED D-dimer. Thromb Haemost. 2000;83(3):416-20.
20. Wong DD, Ramaseshan G, Mendelson RM. Comparison of the Wells and Revised Geneva Scores for the diagnosis of pulmonary embolism: an Australian experience. Intern Med J. 2011;41(3):258-63.
21. Posadas-Martínez ML, Vázquez FJ, Giunta DH, et al. Performance of the Wells score in patients with suspected pulmonary embolism during hospitalization: a delayed-type cross sectional study in a community hospital. Thromb Res. 014;133(2):177-81.
22. Afzal A, Noor HA, Gill SA et al. Leukocytosis in acute pulmonary embolism. *Chest*. 1999;*115*(5), 1329-1332.
23. Dehghani MR, Rezaei Y, Fakour S, et al. White blood cell count to mean platelet volume ratio is a prognostic factor in patients with non-ST elevation acute coronary syndrome with or without metabolic syndrome. Korean Circ J. 2016;46(2):229-38.
24. Fox KA, Dabbous OH, Goldberg RJ, et al. Prediction of risk of death and myocardial infarction in the six months after presentation with acute coronary syndrome: prospective multinational observational study (GRACE). BMJ. 2006;333(7578):1091.
25. Cannon CP, McCabe CH, Wilcox RG, et al. Association of white blood cell count with increased mortality in acute myocardial infarction and unstable angina pectoris. Am J Cardiol. 2001;87(5):636-9.
26. Hilal E, Neslihan Y, Gazi G, et al. Does the mean platelet volume have any importance in patients with acute pulmonary embolism? Wien Klin Wochenschr. 2013;125(13-14):381-5.
27. Kostrubiec M, Łabyk A, Pedowska-Włoszek J, Hrynkiewicz-Szymańska A, Pacho S, Jankowski K, et al. Mean platelet volume predicts early death in acute pulmonary embolism. Heart. 2010;96(6):460-5.
28. Çavuş UY, Yildirim S, Sönmez E, et al. Prognostic value of neutrophil/lymphocyte ratio in patients with pulmonary embolism. Turk J Med Sci. 2014;44(1):50-5.

ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Diagnostic Value of Pronator Quadratus Muscle Thickness Measured by Ultrasonography in Predicting Occult Wrist Fractures

Ultrasonografi ile Ölçülen Pronator Kuadratus Kası Kalınlığının Okült Bilek Kırıklarını Öngörmede Tanısal Değeri

Gamze Çopuroğlu[1], Murat Yeşilaras[2], Yeşim Eyler[2], Ali Turgut[3], Turgay Yılmaz Kılıç[1]

ABSTRACT

Aim: The aim of this study was to investigate the predictive power of pronator quadratus (PQ) muscle thickness, which is measured by focused ultrasonography, in patients applied to the emergency department (ED) with wrist trauma and without bone pathology detected in plain radiography.

Material and Methods: This prospective study was conducted in a tertiary ED. All patients' measurements of the PQ muscle thickness in the longitudinal and transverse planes on both hand sides were performed by emergency medicine residents. For the diagnosis of an occult distal radius fracture and occult wrist injury, orthopedics and traumatology specialist's opinion, which was decided as a result of the outpatient follow-up and additional examinations was used as reference.

Results: No statistically significant difference was found between the PQ muscle thickness of 32 patients without occult wrist injury and 15 patients with occult injury and 6 patients with occult distal radius fracture. Also, no statistically significant difference was found between the PQ muscle thickness difference of the traumatic and non-traumatic sides.

Conclusions: Sonographic measurement of PQ muscle thickness may not an effective method to detect occult distal radius fracture and other occult wrist injuries.

Keywords: Wrist injuries, radius fractures, occult fractures, diagnostic ultrasound

ÖZ

Amaç: Bu çalışmanın amacı, acil servise el bileği travması ile başvuran ve direk grafide kemik patolojisi saptanmayan hastalarda odaklanmış ultrasonografi ile ölçülen pronator kuadratus (PQ) kas kalınlığının prediktif gücünün araştırılmasıdır.

Gereç ve Yöntemler: Bu prospektif çalışma üçüncü basamak bir acil serviste yürütülmüştür. Hastaların her iki taraftaki longitudinal ve transvers düzlemlerde tüm PQ kas kalınlığı ölçümleri acil tıp asistanları tarafından yapıldı. Gizli distal radius kırığı ve gizli el bileği yaralanmaları tanısı için ayaktan takip ve ek tetkikler sonucunda karar veren ortopedi ve travmatoloji uzman görüşü referans alındı.

Bulgular: Gizli bilek yaralanması olmayan 32 hasta ile gizli yaralanması olan 15 hastanın ve gizli distal radius kırığı olan 6 hastanın PQ kas kalınlıkları arasında istatistiksel olarak anlamlı bir fark bulunmadı. Ayrıca travmatik ve travmatik olmayan tarafların PQ kas kalınlık farkı arasında istatistiksel olarak anlamlı bir fark bulunmadı.

Sonuç: PQ kas kalınlığının sonografik ölçümü, gizli distal radius kırığını ve diğer gizli el bileği yaralanmalarını saptamak için etkili bir yöntem olmayabilir.

Anahtar Kelimeler: El bileği yaralanmaları, radius kırıkları, gizli kırıklar, tanısal ultrason

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Introduction

Wrist injuries constitute approximately 20% of the emergency department (ED) admissions due to trauma (1). The wrist has an anatomically and functionally complex structure. Therefore, plain radiographs are insufficient to exclude all injuries alone (2). However, it is important to recognize occult distal radius fractures since they can cause high morbidity. Magnetic resonance imaging (MRI) is the gold standard diagnostic method to detect occult wrist injuries. However, due to being expensive and time consuming, its use in ED is limited.

Pronator quadratus (PQ) muscle is one of the deep flexor compartment muscles of the distal forearm. It is a flat, quadrangular shaped muscle extended from ulna to the radius with a thin adipose tissue cover. This adipose tissue can see as a slightly convex thin radiolucent line parallel to the distal radius in lateral radiographs (3). Hemorrhage into the PQ muscle due to wrist trauma may cause this fat pad to be displaced or disrupted in the lateral radiographs of the wrist. This image, known as PQ fat pad sign (FPS) was reported to have high sensitivity and specificity in wrist fractures (4-6). However, the studies carried out in the following years pointed out otherwise (7-10). Recently, point-of-care ultrasound has been reported to have a high sensitivity for the fracture identification and muscle injuries, but the use of sonographic measurement of PQ muscle thickness for the diagnosis of occult distal radius fractures has not been extensively studied.

The aim of this study was to investigate the ability to predict of occult distal radius injury with PQ muscle thickness sonographic measurement in patients admitted to the ED with wrist trauma and without fracture in plain radiographs.

Material and Methods

This prospective study was conducted between 01.04.2018 and 30.10.2018 in an urban ED with an annual adult admission rate of nearly 170,000. Ethical approval was obtained prior to the study from the local ethics committee (No:16/11.12.2017), and patient consent was obtained to participate in the study.

All patients older than 18 years with wrist trauma and who were considered to have normal radiographs and require short arm splint or elastic bandage due to edema, pain and limitation of motion were to be a candidate in the study. Among these candidates, those who applied during the hours when the sonographers were available were included in the study.

Patients with an open wound or bilateral injury, a history of forearm splint within past six months, with muscle strength disorder (stroke, etc.), history of wrist surgery, previous wrist fracture, an ipsilateral dialysis fistula on the upper extremity, a trauma occurred more than 48 hours who refused to participate in the study and patients with no radiography or sonography due to any reason were excluded from the study. In addition, patients who did not go to the outpatient clinic for follow up and whose final decision was not made by the orthopedic physician were excluded from the study.

Patients and their x-rays were evaluated by emergency medicine attending physicians working in the trauma unit. Sonographic imaging was performed by one of the 4 sonographers participating in the study to those with normal x-rays. Demographic data, the patients' work (overwork with hand or not), hand dominance, trauma side, the mechanism and time of the injury, physical examination findings, immobilization method and sonographic measurement were recorded. Sonographic measurements of the patients were performed by sonographers who were blinded to the physical examination findings and other data of the patients. Sonographic examinations were performed by four volunteer emergency medicine residents (EMRs) who third years of the education. Two-day theoretical and practical ultrasonography training on PQ thickness measurement was given to four EMRs by an emergency medicine attending physician experienced in musculoskeletal ultrasonography.

Sonographic examinations were performed with a 12 MHz linear probe (Philips ClearVue 550 Ultrasound system, The Netherlands.). Measurements were performed as described by Sato et al., while patients' wrists were 5-10 degrees of extension, at full supination, and elbow was on 90 degrees of flexion. Thickness measurements of the PQ muscle in the longitudinal plane were performed from the flexor carpi radialis tendon level, and measurements in the transverse plane were performed from the thickest part of the muscle (11) (Figure 1).

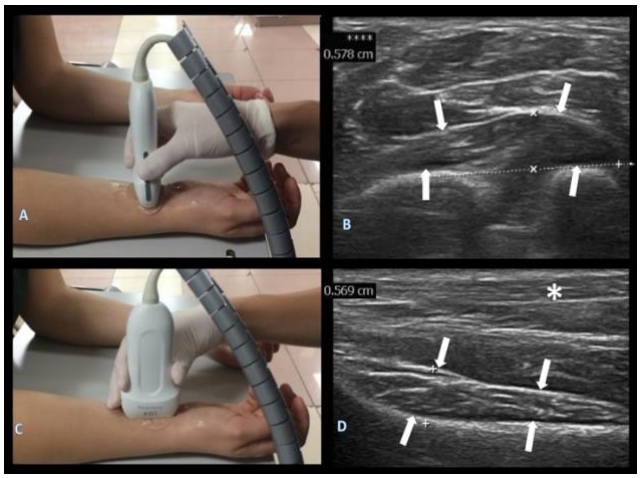

Figure 1. Probe position (A and C) and sonographic images (B and D) of pronator quadratus muscle thickness measurements in longitudinal and transverse planes.
asterisk: flexor carpi radialis tendon

All patients included in the study were referred to the same orthopedics and traumatology specialist for control examination within a week who was blinded to the PQ

muscle measurements performed in the ED. Orthopedic physician was free for perform any imaging examination and follow up time so, his opinion was accepted as the gold standard for the final diagnosis of the patients. The diagnostic value of PQ muscle thickness was analyzed for distal radius fracture and all other occult injuries -all fractures (carpal fractures and distal radius fractures), ligament injuries, joint effusions, cartilage injury- from the patients included in the study.

Sonographers performed measurements on five healthy volunteers before carrying out the study. Measurements were made in the transfers and longitudinal planes by the sonographer from both sides of the volunteer. It was found that there was a perfect agreement between the measurements [intraclass correlation coefficient= 0.875 (95% confidence interval: 0.825-0.911)].

The sample size was calculated using OpenEpi software (v3.01) [12]. When the PQ muscle thickness of 6.2 ± 1.5 mm in cases with fracture, 4.5 ± 1.2 mm in cases without fracture and occult fracture prevalence was taken as 20% [11]. It was found that 42 cases with an 80% power and 95% confidence level were the minimum sample size for the study. An additional 10% error margin was for any potential error. According to those calculations the decision was made to include 47 participants in the study.

The data were recorded in different forms during the ED and outpatient control stages. SPSS 22.0 was used to record and analyze all research data. Qualitative data were expressed as frequencies and rates, while quantitative data were expressed as median, interquartile range, and minimum-maximum values since the research data did not conform to the normal distribution. Mann Whitney U test was used in the quantitative data analysis. All analyzes were performed in a 95% confidence interval. A p-value of less than 0.05 was considered significant.

Results

This study was conducted with 47 patients who came to outpatient clinic follow-up. The patient flow diagram is shown in Figure 2.

Demographic information of the patients was presented in Table 1. The median time between the injury and admission to the ED was 9 (IQR: 12, min.:0- max: 48) hours. All patients, except 2 (4.3%) patients who were not accept, were undergoing an immobilization method that were 27 (57.4%) short arm volar splints, 18 (38.3%) elastic bandages. All patients who were evaluated in the outpatient clinic, were underwent any imaging examination which were 14 plain radiography, 13 MRI, 2 computed tomography (CT) and 1 electromyography at the discretion of the orthopedics and traumatology specialist. 17 of the patients were not underwent any imaging examination in addition to first radiography in the ED.

Female (n; %)	25 (53.2)
Age (median years, IQR, min-max)	34 (20, 18 – 68)
Right-handed (n; %)	42 (89.4)
Job requiring physical strength (n; %)	29 (61.7)
Right wrist trauma (n; %)	18 (38.3)
Falls on to an outstretched hand (n; %)	19 (40.4)
Occult wrist injuries (n; %)	15 (32)
Ligament injuries and joint effusions	7 (47)
Distal radius fractures	6 (40)
Carpal bone fractures	2 (13)

Table 1. Demographic information of the patients

No statistically significant difference was found between the PQ muscle thickness of 32 patients without occult wrist injury and 15 patients with occult injury and 6 patients with occult distal radius fracture (Table 2). Also, no statistically significant difference was found between the PQ muscle thickness difference of the traumatic and non-traumatic sides (Table 3).

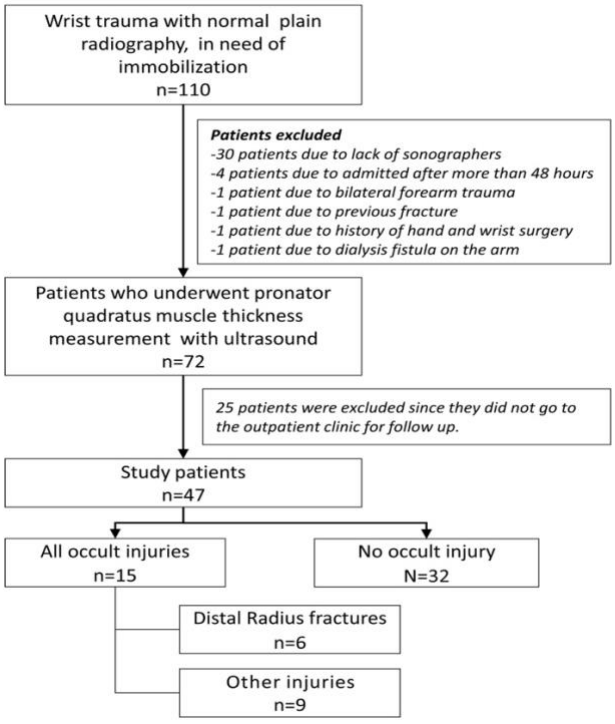

Figure 2. The patient flow diagram

Discussion

In this study, we measured the PQ muscle thickness with ultrasonography for the detection of occult distal radius fracture in patients with normal radiography presenting to the ED with wrist trauma. No statistically significant difference was found between the PQ muscle thickness measurements performed in the longitudinal and transverse planes of patients with and without occult distal radius fracture.

Sato et al. measured the PQ muscle thickness of 55 patients with normal radiographs following acute trauma on both longitudinal and transverse planes by ultrasonography [11]. Occult bone injury was detected with MRI in 23 (92.0%) of 25 patients with PQ muscle swelling. In this study, the

difference between PQ muscle thickness measurements on the affected and unaffected side after trauma was 1.7 ± 1.1 mm in the longitudinal plane and 2.0 ± 1.7 mm in the transverse plane. They reported that the sonographic swelling of the PQ muscle as a result of these data may be indicative of occult bone injury in patients with normal plain radiographs and that ultrasonography can be used for the decision of more detailed imaging studies in these patients. However, this study showed only positive predictive value since patients with normal PQ muscle measurements have not been examined by MRI. It was contained bias in the selection of patients undergoing sonography. Also, PQ muscle atrophies, anatomical variants or occupational factors may have affected the results. In our study, the orthopedist's opinion, which was decided as a result of outpatient follow-up and additional examinations was set as the reference standard for occult injuries. No statistically significant difference was found between the PQ muscle thickness of 32 patients without occult wrist injury and 6 patients with occult distal radius fracture. Also, no statistically significant difference was found between the PQ muscle thickness difference of the traumatic and non-traumatic sides However, in our study, the increase of PQ muscle thickness on the trauma side in both groups with and without occult injury suggests that the sonographer may have a bias. On the other hand, all patients had at least one examination finding such as edema, pain and limitation of motion and an immobilization method was applied to all patients except two because of do not accept. Accordingly, it can be thought that all patients have a certain minor soft tissue trauma even if there is no bone fracture and that the PQ muscle thickness on the traumatic side may have increased due to soft tissue trauma.

In another study, a significant difference was detected in the maximum PQ muscle thickness between the dominant and nondominant hands in healthy volunteers [13]. A significant difference was shown in the comparison between males and

		No occult injury (n = 32)		All occult injury (n=15)		Occult distal radius fracture (n=6)		
		Median	IQR (min-max)	Median	IQR (min-max)	Median	IQR (min-max)	P value*
Traumatic PQ muscle thickness (mm)	**Longitudinal**	5.38	2.64 (2.9-12.2)	5.0	2.26 (3.37-8.9)			0.681
						5.78	1.88 (4.42-8.90)	0,245
	Transverse	6.58	2.71 (1.32-11.4)	6.87	3.43 (3.97-11.3)			0.749
						7.14	2.21 (5.78-9.80)	0.245

IQR: Interquartile Range, min:minimum, max: maximum, Mann Whitney U test*

Table 2. Pronator quadratus muscle thicknesses of traumatic sides in patients with no occult injury, all occult injury and only occult distal radius fracture.

females, regardless of hand dominance. Also, a significant difference in PQ thickness between dominant and nondominant hands was shown. They reported that gender and hand dominance must be considered in sonographic studies. However, it should be noted that this study was conducted in a small population and mainly in young volunteers with right-hand dominance. We investigated the PQ muscle thickness difference of the traumatic wrist side versus non-traumatic side. But no statistically significant difference was found. The ratio of women and men was close to each other in the patients included in our study. However, 42 (89.4%) of the patients were right-handed, and 18 (38.3%) had right-hand trauma. In our study the median age of the patients was 34 (IQR: 20, min.:18 – max.: 68) years and there were 29 (61.7%) patients who had a job requiring physical strength. Due to patient diversity and anatomical variations, it is difficult to determine the normal and pathological value of PQ muscle thickness. Given all this, sonographic measurements of the PQ muscle may not be an effective method to predict occult injuries.

In recent years, the PQ FPS in radiography has studied extensively because of its importance for the radiographic diagnosis of wrist fractures [7-10]. The sensitivity of PQ FPS was reported lower in studies which use MRI or CT as a reference than use plain radiography. This result is due to differences in the gold standard diagnostic tests and study population selection. In the study with a high sensitivity, the study population was selected from patients with nondisplaced fractures. in fact, occult fractures were not detected. However, the strength of this study is that the

		No occult injury (n = 32)		All occult injury (n=15)		Occult distal radius fracture (n=6)		
		Median	IQR (min-max)	Median	IQR (min-max)	Median	IQR (min-max)	P value*
Traumatic wrist versus non-traumatic wrist PQ muscle thickness difference (mm)	**Longitudinal**	0.42	1.2 (-0.46 - 5.59)	0.51	2.12 (-2.32 -3.26).			0.624
						0.67	1.79 (-0.35 – 2.07)	0.953
	Transverse	0.61	1.16 (-1.3 - 3.28)	0.27	1.62 (-1.85-7.19)			0.486
						0.93	1.38 (-0.61 – 1.54)	0.830

*IQR: Interquartile Range, min: minimum, max: maximum, * Mann Whitney U test*

Table 3. Pronator quadratus muscle thicknesses difference of traumatic wrist side versus non-traumatic wrist side in patients with no occult injury, all occult injury and only occult distal radius fracture.

Author	Year	Age	Study population	Gold standard test for diagnosis of fracture	Case group (n)	Control group (n)	Frequency of PQ FPS * (%)	Sensitivity for fracture (%)	Specificity for fracture (%)	Classification of patient
Annamalai G et al	2003	N/A	Patients with wrist trauma who had initial radiograph no fracture	MRI	50 patients distal radius fracture	50 patients no fracture	25	26	70	Three groups according to the morphological appearance of PQ muscle. (normal, displaced, absent)
Fallahi F et al.	2012	Over 16 years	Patients with wrist trauma who had initial radiograph no fracture	MRI	28 patients PQ altered	40 patients PQ normal	41	65	69	Four groups according to the morphological appearance of PQ muscle. (normal, raised, obliterated, disrupted)
Sun B et al.	2016	Over 16 years	Patients with undisplaced wrist fracture	Standard plain radiography	106 patients Undisplaced wrist fracture	210 patients Non-traumatic volunteers	N/A	91	84	According to the muscle-to-bone thickness ratio (PQ muscle / distal radius =0.4)
Loesaus J et al.	2017	Over 18 years	Patients with wrist trauma who had initial radiograph no fracture	CT	44 patients distal radius fracture	45 patients no fracture	26	48	96	According to the thickness of the PQ muscle (8mm in females and 9mm in males).

* Frequency of PQ FPS according to the specific classification of the study, MRI: magnetic resonance imaging, CT: Computed tomography, PQ: pronator quadratus

Table 4. Studies investigating the diagnostic value of pronator quadratus (PQ) fat pad sign (FPS) for fracture diagnosis

number of patients is higher than double of the others and the ratio between maximum PQ thickness and the same level of the distal radial thickness (DRT) was used in the diagnosis of fracture [9]. The muscle-to-bone ratio reduces errors that may result from single measurement and the effect of variable factors (such as gender and body size) affecting PQ muscle thickness. The recent studies investigating PQ FPS radiographically are shown in Table 4. In our study, sonographic measurement of PQ muscle thickness was not helpful to diagnose occult distal radius fractures in patients with normal radiography. For the diagnosis of an occult distal radius fracture, orthopedics and traumatology specialist's opinion, which was decided as a result of the outpatient follow-up and additional examinations was used as reference. The sample size was calculated prior to the study but our occult fracture prevalence was lower than we expected.

There were a few limitations of our study. Firstly, the final diagnosis of the patients was not confirmed by MRI. However, the reliability of the final diagnosis made by an orthopedics and traumatology specialist who was free to request an examination is close to the gold standard. The other limitation of our study was sonographic measurements of the PQ muscle made by EMRs have not been validated by an experienced sonographer. Even if EMRs were blinded to physical examination findings, it would not be difficult to predict the traumatic side during sonographic measurements, which may have caused practitioners to take sides.

Conclusion

The frequency of occult wrist injuries is high in patients admitted to the ED with wrist trauma and who have normal radiographic findings with require immobilization physical examination findings. Sonographic measurement of PQ muscle thickness is may not an effective method to detect occult distal radius fractures.

Conflict of Interest: The authors declare no any conflict of interest regarding this study.

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

Ethical Statement: Ethical approval for this study was obtained from Health Science University Izmir Tepecik Training and Research Hospital Ethics Committee with the approval number 14/11.12.2017/16

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

References

1. Larsen CF, Mulder S, Johansen AM, et al. The epidemiology of hand injuries in The Netherlands and Denmark. European Journal of Epidemiology 2004;19(4):323–7. DOI: 10.1023/b:ejep.0000024662.32024.e3
2. Welling RD, Jacobson JA, Jamadar DA, et al. MDCT and radiography of wrist fractures: radiographic sensitivity and fracture patterns. American Journal of Roentgenology 2008;190(1):10-6. DOI: 10.2214/AJR.07.2699
3. Gray H, Standring S, Ellis H, et al. Gray's anatomy: the anatomical basis of clinical practice. 39th ed. Edinburgh: Elsevier Churchill Livingstone; 2005.
4. MacEwan DW. Changes due to trauma in the fat plane overlying the pronator quadratus muscle: a radiologic sign. Radiology 1964;82(5):879-86. DOI: 10.1148/82.5.879
5. Curtis DJ, Downey Jr EF, Brower AC, et al. Importance of soft tissue evaluation in hand and wrist trauma: statistical evaluation. American Journal of Roentgenology 1984;142(4):781-8. DOİ: 10.2214/ajr.142.4.781
6. Sasaki Y, Sugioka Y. The pronator quadratus sign: its classification and diagnostic usefulness for injury and inflammation of the wrist. Journal of Hand Surgery Br 1989;14(1):80-3. DOİ: 10.1016/0266-7681(89)90021-1
7. Annamalai G, Raby N. Scaphoid and pronator fat stripes are unreliable soft tissue signs in the detection of radiographically occult fractures. Clinical Radiology 2003;58(10):798-800. DOI: 10.1016/S0009-9260(03)00230-7
8. Fallahi F, Jafari H, Jefferson G, et al. Explorative study of the sensitivity and specificity of the pronator quadratus fat pad sign as a predictor of subtle wrist fractures. Skeletal Radiology 2013;42(2):249-53. DOI: 10.1007/s00256-012-1451-0
9. Sun B, Zhang D, Gong W, et al. Diagnostic value of the radiographic muscle-to-bone thickness ratio between the pronator quadratus and the distal radius at the same level in undisplaced distal forearm fracture. European Journal Radiology 2016;85(2):452-8. DOI: 10.1016/j.ejrad.2015.12.002
10. Loesaus J, Wobbe I, Stahlberg E, et al. Reliability of the pronator quadratus fat pad sign to predict the severity of distal radius fractures. World Journal of Radiology 2017;9(9): 359-64. DOI: 10.4329/wjr.v9.i9.359
11. Sato J, Ishii Y, Noguchi H, et al. Sonographic swelling of pronator quadratus muscle in patients with occult bone injury. BMC Medical Imaging 2015;15:9. DOI: 10.1186/s12880-015-0051-6
12. Dean AG, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2013/04/06, accessed 2020/05/19.
13. Sato J, Ishii Y, Noguchi H, et al. Sonographic Appearance of the Pronator Quadratus Muscle in Healthy Volunteers. Journal of Ultrasound Medicine 2014;33:111–7. DOI: 10.7863/ultra.33.1.111

ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Review of Patients who are Hospitalized by Emergency Medicine Specialist

Acil Tıp Uzmanı Tarafından Yatırılan Hastaların İncelenmesi

Nuray Aslan [1], Ensar Durmuş[1], Necip Gökhan Güner[1], Fatih Güneysu[1], Fatih Çatal[1], Yusuf Yürümez[1]

ABSTRACT

Aim: Although some of the patients admitted to the emergency room (ER) have a clinical indication for hospitalization, they may not have a confident diagnosis of which branch they will be admitted to. Therefore, this research intended to present the undiagnosed patients' features whom emergency medicine specialists (EMS) hospitalized.

Material and Methods: This research is a retrospective, cross-sectional and descriptive study. Patients admitted to Sakarya Training and Research Hospital's ER and hospitalized by EMS on behalf of a branch were included in the study. Data obtained from the study were analysed using IBM SPSS Statistics 21.

Results: The mean age of 57 patients was 70 (min: 56 - max: 80), and 30 (52.6%) of the cases were men. In the department-based evaluation of the consultations, it was ascertained that an average of 2.49 (SD=1.17) branch consultations was requested for each patient, and the average number of consultations per case was 4.16 (SD=2.09). As the number of consultations raised, the time between the emergency service application and the hospitalization decision increased statistically significantly ($p<0.016$). It was observed that most hospitalizations were because the departments did not make the decision to be hospitalized (n: 40, 70.2%); furthermore, the most hospitalizations were made to the internal medicine department (n: 28, 49.1%), and the majority of the cases were admitted to the service. It was observed that only one patient needed intensive care after hospitalization (n: 1, 1.8%), and there was no interdepartmental patient turnover and mortality after the hospitalization.

Conclusion: The main reason for the EMS' hospitalization arrangement was the refusal of other branches to determine hospitalization. Therefore, it was perceived that the emergency specialists' hospitalization decisions were essentially accurate.

Keywords: Emergency room, consultation, hospitalization

ÖZ

Amaç: Bu çalışmada, AS sorumlu uzman tabiplerince değerlendirilen ve tıbbi durumunun gerektirdiği en uygun uzmanlık dalına ait kliniğe yatışı yapılan hastaların değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: Bu çalışma 01.01.2019 - 30.04.2021 dönemini kapsayan retrospektif, kesitsel ve tanımlayıcı nitelikte bir çalışmadır. Çalışma örneklemi, Sakarya Eğitim ve Araştırma Hastanesi (SEAH) AS'ne başvuran ve AS sorumlu uzman tabiplerince yatırılan vakalardır. Tanılar International Classification of Diseases-10 (ICD-10) tanı kodlama sistemi kullanılarak kategorize edildi. Hastalara ilişkin veriler hastane otomasyon sisteminden elde edilerek kayıt altına alınmıştır.

Bulgular: Yatış kararı verilen 57 hastanın ortalama yaşları 70,00 (min: 56 - max: 80) olup, hastaların 30 (%52,6)'u erkek idi. Konsültasyonların bölüm bazlı değerlendirmesinde her hasta için ortalama 2,49 (SD=1,17) konsültasyon istendiği ve hasta başına yapılan ortalama konsültasyon sayısının ise 4,16 (SD=2,09) olduğu tespit edildi. Konsültasyon istem sayısı arttıkça başvuru ile yatış kararı verilmesi arasında geçen sürenin istatistiksel olarak anlamlı derecede arttığı saptandı ($p<0,016$). Yatışların en fazla bölümlerin yatış kararı vermemesinden kaynaklandığı (n: 40, %70,2), yatışın en fazla dahili branşlarda iç hastalıklarına (n:28, %49,1), hastaların büyük bir çoğunluğunun servise yatırıldığı, yatış sonrası yalnızca bir (n: 1,%1,8) hastada yoğun bakım ihtiyacının olduğu, servisler arası hasta devrinin ve mortalitenin olmadığı saptandı.

Sonuç: AS sorumlu uzman tabiplerince verilen resen yatış kararının özellikle tanısı konulmuş ancak ilgili bölümlerin yatış kararı vermemesinden kaynaklandığı ve yatış kararının doğru ve yerinde olduğunu olduğu anlaşılmaktadır.

Anahtar Kelimeler: Acil servis, konsültasyon, hastaneye yatış

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Introduction

Emergency rooms (ER) provide 24/7 continuous health service to patients in need of emergency medical care. After the initial evaluation of the patients admitted to the ER, diagnosis and treatment processes are initiated (1). During these processes, emergency medicine specialists (EMS) can resolve the acute problem and discharge the patient or consult other specialists in need. In addition, consultant physicians may suggest making treatment recommendations, making a discharge decision, counseling hospitalization, or requesting the patient's referral to another health institution (1). With this essential role in decision mechanisms, consultations are an integral part of ER (2).

Consultation is acknowledged as interventions presented by a consultant with specific expertise (3). The literature confirms that the rate of EMS demanding consultation ranges between 20-60% (4,5). Several guidelines prescribe that emergency consultations should be responded to within 30-45 minutes, depending on the patient's current clinical condition (6,7). One of the fundamental reasons for ER crowding is the prolongation of the consultation processes in some countries. This situation is negatively influenced by consultant physicians' treatment recommendations, which allow the patient to stay in the ER for a long time; the patient cannot be determined regarding hospitalization or discharge. Also, additional consultations requested for the patient the patient and the unwillingness of consultant physicians to adopt the patient, especially in complicated patients who require a multidisciplinary approach, are other essential factors that negatively affect the process (4,8,9).

Health legislation was updated in 2018 to reduce these harmful circumstances in consultation processes, and it was demanded that patient follow-up in ER not exceed 24 hours. However, during the stay in the ER, the patients' hospitalization decision who can not have a definite diagnosis and patients need a multidisciplinary approach was left to the EMS (10). Nevertheless, there is inadequate data about patients hospitalized by EMS after this regulation in the current literature.

This research aimed to present the patients whose hospitalization decisions had to be made by EMS.

Material and Methods

Research Type

This study is a retrospective, cross-sectional and descriptive study covering the period between 01.01.2019 - 30.04.2021. The study sample group is the cases who applied to the Sakarya Training and Research Hospital (SEAH) ER but were not intended to be hospitalized by the other branches' consultant physicians and had to be hospitalized on behalf of a branch by the EMS. Consequently, the population of the investigation is the patients admitted to the ER and hospitalized.

Definitions

SEAH is a tertiary hospital that includes all specialties. The adult ER is an area where emergency medicine specialists, research assistants, and general practitioners work unitedly, and approximately 1000 cases are examined daily. In addition, traumatic and non-traumatic cases can be admitted to the ER by ambulance or outpatients. The emergency physicians manage the patients' diagnosis-treatment processes, and other branches' consultation can be inquired on the hospital automation system if necessitated. However, EMS can hospitalize patients who can not have a final hospitalization decision after other specialties' interviews by the medical condition of cases. EMS have been authorized in this regard by legal regulations in Turkey (10).

Inclusion Criterias

- Patients aged 18 and over,
- Consulted cases,
- Patients who have not a definitive diagnosis or whose hospitalization indication has not been determined,
- Patients with a hospitalization indication and involving multidisciplinary approach,
- Cases who were hospitalized by EMS,

Exclusion Criterias

- Patients whose data cannot be obtained on the automation system.

Data Collection

Patients' age, gender, complaints, comorbidities, laboratory test results (hemogram, biochemistry, blood gas, coagulation parameters, complete urinalysis, stool microscopy, serology), electrocardiography (ECG), imaging methods used (X-ray, ultrasonography, computed tomography, magnetic resonance), requested consultations, hospitalization status (diagnosis, length of hospital stay and outcome) were obtained from the hospital automation system and patient files. In addition, the social insurance invoice costs of the treatments and tests applied to the patients in the emergency room were also noted. Patient diagnoses were classified using the International Classification of Diseases-10 (ICD-10) system.

Statistical Analysis

The rule of three was used to calculate 95% CI in categories with no events. For continuous variables that do not fit the normal distribution according to the Kolmogorov-Smirnov test of normality, Mann–Whitney U-test or Kruskal Wallis test were used for comparison of continuous endpoints All tests were performed with a two-sided significance of 5%. For each endpoint, the absolute and relative effects and their corresponding 95% CIs were calculated as recommended by Altman et al. All analyses were performed using IBM SPSS Statistics 21.

Ethics Approval and Permissions

Sakarya University Faculty of Medicine Non-Invasive Ethics Committee approval (29.05.2021 dated and number E-71522473-050.01.04-32190-307) was obtained. All procedures were conducted following the ethical standards

of the institutional and national research committee and the 2004 Helsinki Declaration.

Results

A total of 57 patients who were hospitalized by EMS were included in the study. The mean age was 70 (min: 56 - max: 80) years, and 30 (52.6%) of them were male. The most frequent ailment was a mental status deterioration [in 10 patients (17.5%)], and the most common comorbidity was hypertension [in 27 patients (47.4%)]. Demographic characteristics, vital signs, and comorbidities of hospitalized patients are shown in Table 1.

		n = 57
	Age (median;IQR)	70 (56-80)
Gender	Female (%)	27 (47)
	Male (%)	30 (53)
Patient complaints	Mental status deterioration (%)	10 (18)
	Abdominal pain	9 (16)
	Weakness	8 (14)
	Dyspnea	6 (11)
	Vomiting	4 (7,)
	In-vehicle traffic accident	2 (4)
	Fever	2 (4)
	Bloody stool	2 (4)
	Others*	14 (25)
Vital Signs	Systolic blood pressure (mmHg) (median;IQR)	130 (90-150)
	Diastolic blood pressure (mmHg) (median;IQR)	72 (60-80)
	Pulse (/dk) (median;IQR)	89 (72-100)
	Fever (^{0}C) (median;IQR)	36,5 (36,1-36,8)
	Oxygen saturation (%) (median;IQR)	95 (90-98)
Comorbidities	Hypertension (%)	27 (47)
	Coronary artery disease (%)	19 (33)
	Diabetes (%)	13 (23)
	Malignancy (%)	7 (12)
	Congestive heart failure (%)	10 (18)
	Chronic obstructive pulmonary disease (%)	5 (9)
	Cerebrovascular Disease (%)	5 (9)
	Chronic renal failure (%)	7 (12)

***** Syncope, icterus, foreign body in the throat, bleeding from the wound, chest pain, numbness in the arms, edema in the body, gunshot wounds, diarrhea, palpitations, nausea, vision loss, arm pain, leg edema.

Table 1. Demographics, vital signs and comorbidities

It was ascertained that computed tomography (CT) was inquired the most from the patients participating in the study; moreover, an average of two CT requests was made per case. Diagnostic tests applied in patients hospitalized by an EMS physician are presented in Table 2.

Each patient was meanly consulted to three branches (SD=2) five times (SD=2). It was ascertained that as the consultation numbers increased, the time between the application and the hospitalization decision increased significantly (H=12,177, SD=4, p=0.016). The relationship between the consultation number and the length of stay (LoS) in the ER is displayed in Table 3.

It was observed that the most common hospitalization diagnosis of the patients included in the study was anemia with several 13 (23%) patients. The main reason for the hospitalization determination of the EMS was that other branches did not decide to hospitalize the patients (n: 40; 70%). Patients were primarily hospitalized in internal medicine wards (n: 28; 49%) and then general surgery wards among surgical branches (n: 5; 9%). It was ascertained that 56 (98%) of the patients were admitted to the service; furthermore, intensive care was needed in only one (2%) patient after hospitalization. There was no patient transfer between branches following hospitalization; no mortality was perceived in any patients. The shortest LoS in ER was found to be 678 minutes; also, the most prolonged LoS in ER was found to be 1536 minutes. Patients' diagnosis, LoS in ER, and outcome data are shown in Table 4.

Discussion

Throughout the study period, the patients' number admitted to SEAH adult ER was 759846, of which 33992 (4.5%) were hospitalized. The hospitalized patients' mean age was 44 years. It has been stated in the literature that the hospitalized patients' age range from the ER is 40-79 years mostly (11). However, patients' mean age who had to be hospitalized by EMS was 70 years. Publications assert that the clinic's severity increases with the age of 65 and older in

Diagnostic tests	Patient count n (%)	Tests per patient (Mean; SD)
Hemogram	55 (97)	2 (1)
Biochemical parameters	56 (98)	2 (1)
Blood gas analysis	40 (70)	1 (1)
Coagulation parameters	39 (68)	1 (1)
Urine tests	27 (47)	1 (1)
Stool analysis	2 (4)	0.03 (0.2)
Rt-PCR	7 (12)	0.1 (0.3)
Hormone Tests	40 (70)	1 (1)
Electrocardiography	28 (49)	1 (1)
X-ray	23 (40)	1 (1)
Ultrasonography	15 (26)	0.3 (1)
CT	**18 (32)**	**2 (2)**
Magnetic Resonance Imaging	7 (12)	0.2 (1)

Table 2. Diagnostic tests applied

patients admitted to the ER, making patient management more complicated (12,13). The average age of the patients hospitalized by the emergency physician in our study is 70, consistent with the literature. The number of cases hospitalized by EMS to all hospitalized patients is only 0.17%, representing a small group of patients.

Consultation number	LoS in the ER (minute)	p-value*
1	427 (258-923)[a]	
2	891 (583-1344)	
3	1028 (608-1147)	**0.016***
4	1242 (796-2051)	
5 and more	1299 (926-2051)[a]	

* Kruskal Wallis test was applied while calculating the p-value.

[a] A statistically significant difference was found between the values indicated with the same letter in the subgroup analysis using Bonferroni correction and Mann Whitney U test (U=22583,000, p=0.029, z=-2,981 r=-0,64).

Table 3: The correlation of consultation number and the length of stay in the ER

Our study remarked that the most frequent ailment in patients admitted to the hospital was mental status change. In research conducted in the USA on this subject, it was published that approximately 1.5 million emergency applications per year were originated from mental state deterioration (14). Likewise, Christopher et al. also described that 8% to 10% of patients over 65 years who applied to the ER had a degradation in mental status (15,16).

The majority of patients admitted to the emergency department have comorbidity. Yıldız S. et al. reported that 87.3% of patients admitted to the emergency department had one or more comorbidities. Hypertension is the most common comorbidity with a rate of 58.2%, followed by diabetes with 33.4% and coronary artery diseases with 28.3%, respectively (17). Thus, the result of both this study and our study overlap in that hypertension is the most common comorbidity.

Although EMS uses anamnesis, physical examination, laboratory, and imaging methods to diagnose patients, recently increasing technological developments and easy accessibility have brought imaging methods to the fore (18). In the literature, it has been affirmed that EMS frequently utilizing imaging methods for reasons such as rapid and definitive diagnosis, refraining from avoiding the disease, the request of the consultant physicians, and medicolegal problems. CT is one of the most preferred imaging methods in all age groups, especially in patients over 65 (19,20). CT was the most inquired imaging method among the patients participating in our study is steady with the literature.

Consultations requested from other branch specialists are essential in emergency patient management. For example, EMS may demand a consultation to refer to other specialties' knowledge in diagnosing and treating a complex case and obtain a decision in the form of discharge or hospitalization. Nevertheless, treatment and patients' hospitalization of cases who need a multidisciplinary approach, whose general condition is poor and primarily in the geriatric age group, is not undertaken by any department (1). Intercalarily, the tests request and other department consultations suggested by the consultant physician, which are not urgent in the patient's diagnosis and treatment, from the emergency service expands the consultations number. As a result, it may prolong the time taken for the patient to be hospitalized an LoS in ER (1). Parallel to the increase in the consultations number in our study outcomes, prolonging patients' waiting time in the emergency department is similar to the literature data (21,22).

Among the diseases that require the most hospitalization from the ER, internal causes such as drug interactions, infections, metabolic disorders, and cardiac causes can be counted (26). However, in our study, it was recognized that anemia patients had to be hospitalized by EMS regularly. The fact that anemia is prevalent, especially in developing countries and the need for 24-hour follow-up of the patient in early transfusion complications after erythrocyte suspension replacement may explain these circumstances (16,17). This result can be interpreted as the EMS's tendency to treat patients who need a blood transfusion in the ward. Hence, it can be appreciated that the patients were hospitalized mainly in the internal medicine branch's wards. The fact that the patients hospitalized in our research were not transferred between branches after hospitalization can be interpreted as the EMS decided when choosing a branch correctly. Unfortunately, no comparison could be made due to insufficient information in the literature about this topic.

The time elapsed between the emergency admission and hospitalization of the patients is closely related to emergency patient management and has been associated with morbidity and mortality of the patients (27,28). In a study by Shen Y et al., the time from the decision of

			n=57 (%)
Diagnosis	D64.9: Anemia, unspecified (%)		13 (23)
	N17: Acute kidney failure (%)		5 (9)
	K72.9: Hepatic failure, unspecified (%)		4 (7)
	R10: Abdominal and pelvic pain (%)		4 (7)
	R50,9: Fever, unspecified (%)		3 (5)
	K92.2: Gastrointestinal hemorrhage, unspecified (%)		2 (4)
	E87.8: Other disorders of electrolyte and fluid balance, not elsewhere classified (%)		4 (7)
	N28.0: Ischemia and infarction of kidney (%)		2 (4)
	Z03: Encounter for medical observation for suspected diseases and conditions ruled out (%)		2 (4)
	Other* (%)		18 (32)
Reason for hospitalization	Diagnosis could not found (%)		17 (30)
	No branches aspire patient hospitalization (%)		40 (70)
Hospitalization department	Non-Surgical Branches	Internal medicine (%)	28 (49)
		Infectious diseases (%)	5 (9)
		Pulmonology (%)	2 (4)
		Gastroenterology (%)	4 (7)
		Cardiology (%)	1 (2)
		Neurology (%)	1 (2)
	Surgical Branches	Orthopedics (%)	3 (5)
		General surgery (%)	5 (9)
		Gynecology (%)	2 (4)
		Ear Nose Throat Diseases (%)	2 (4)
		Neurosurgery (%)	1 (2)
		Urology (%)	3 (5)
Patient's unit	Ward		56 (98)
	ICU		1 (2)
The need for ICU after hospitalization	Yes		1 (2)
	No		55 (9)
Patient transfer between branches	Yes		57 (100)
	No		0
Outcome	Discharged		51 (90)
	Refused Treatment		1 (5)
	Escape		3 (2)
	Referral to another institution		2 (4)
LoS from application to hospitalization decision (min) (median; IQR)			1063 (678-1536)
LoS until admission to service after hospitalization decision (min) (median; IQR)			124 (62-383)

*****Ascites, intracerebral Hemorrhage, viral hepatitis, cholelithiasis, diabetic ketoacidosis, cholecystitis, foreign body in the alimentary tract, retroperitoneal bleeding, cellulitis, acute gastroenteritis, ventricular tachycardia, injury of the lip and oral cavity, open wound of the head, chronic kidney failure, cerebrovascular disease, prosthesis infection, compartment syndrome, extremity abscess.

Tablo 4. Patients' diagnosis, LoS in ER, and outcome data

hospitalization to admission to the ward was found to be 139 minutes, which is similar to our study result of 124 minutes (29). Although this result seems acceptable, the main obstacle is the long time elapsed from the admission of the patients to the ER until the decision for hospitalization is made. In our study, this period was 1063 minutes (17.7 hours), and the EMS' authorization to hospitalize patients may have played a role in preventing further prolongation of this period.

Limitations

The limitations of our study are that it is retrospective and single-centered. Also, due to insufficient information in the literature related to the subject of our study, it should be supported with a more extensive patient series to be conducted.

Conclusion

It was observed that the EMS' hospitalization decision was caused by the refusal of the relevant branches to hospitalize the patient, especially in the diagnosed patients. It is recognized that the hospitalization decisions made by the EMS were primarily correct and appropriate. However, due to insufficient information in the literature related to the subject of our study, it should be supported with a more extensive patient series to be conducted.

Conflict of Interest: The authors declare no any conflict of interest regarding this study.

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Authors' Contribution: NA; Led and conceived the project, and authored the manu-script, ED; Data collection, compiling, statistics and discussion, NGG; Contributed to design articles, collected and analysed data, FG; Contributed to collect and analyse data, FÇ; Collected and analysed data, literature review and discussion, YY; Helped perform the analyses with constructive discussions. The manuscript was written and approved by all authors.

Ethical Statement: Ethical approval for this study was obtained from Sakarya Training and Research Hospital Ethics Committee with the approval number E-71522473-050.01.04-32190-307.
All authors declared that they follow the rules of Research and Publication Ethics.

References

1. Dönmez SS, Durak VA, Torun G, ve ark. Acil serviste gerçekleştirilen konsültasyon sürecinin incelenmesi. Uludağ Üniversitesi Tıp Fakültesi Dergisi. 2017;43(1):23-28.
2. Chan T, Orlich D, Kulasegaram K, et al. Understanding communication between emergency and consulting physicians: A qualitative study that describes and defines the essential elements of the emergency department consultation-referral process for the junior learner. CJEM. 2013;3(15):42–51. doi: 10.2310/8000.2012.120762
3. Guertler AT, Cortazzo JM, Rice MM. Referral and consultation in emergency medicine practice. Acad Emerg Med Off J Soc Acad Emerg Med. 1994;1(6):565–71. doi: 10.1111/j.1553-2712.1994.tb02557.x
4. Lee RS, Woods R, Bullard M, et al. Consultations in the emergency department: A systematic review of the literature. Emerg Med J. 2008;25(1):4–9. doi: 10.1136/emj.2007.051631
5. Weston K. Cause for concern ensuring adequate and timely on-call physician coverage in the emergency department. Watch. 2000;4:1–36.
6. Hexter DA, Henry GL. Working with consultants. Foresight risk manangement. Emerg Physicians. 2002;1(7):303–6.
7. Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü [Internet]. [cited 2021 May 5]. Available from: https://www.resmigazete.gov.tr/eskiler/2018/02/20180220-4.htm
8. Ospina MB, Bond K, Schull M, et al. Measuring overcrowding in emergency departments: a call for standardization. Technol Rep. 2006;(67.1).
9. AJ Drummond. No room at the inn: overcrowding in Ontario's emergency departments. CJEM. 2002 ;4(2):91-7. doi: 10.1017/s1481803500006187
10. T.C. Resmî Gazete [Internet]. [cited 2021 May 24]. Available from: https://www.resmigazete.gov.tr/eskiler/2007/03/20070315-6.htm
11. Gomes JCP, Dias RD, de Barros JV, et al. The growing impact of older patients in the emergency department: a 5-year retrospective analysis in Brazil. BMC Emerg Med. 2020 Jun 11;20(1):47.
12. Kılıçaslan İ, Göksu E. Türkiye'de Acil Servise Başvuran Hastaların Demografik Özellikleri. Turk J Emerg Med. 2005; 5(1): 5-13
13. Pinto Júnior D, Salgado P de O, Chianca TCM. Validez predictiva del protocolo de clasificación de Riesgo de Manchester: evaluación de la evolución de los pacientes admitidos en un pronto atendimiento. Rev Lat Am Enfermagem. 2012;20(6):1041–7.
14. Carpenter CR, Hammouda N, Linton EA, et al. Delirium prevention, detection, and treatment in emergency medicine settings: A geriatric emergency care applied research (GEAR) network scoping review and consensus statement. Acad Emerg Med. 2021;28(1):19–35.
15. Kekeç Z, Koc A, Buyuk S. Review of Geriatric Patients Hospitalization in Emergency Department. Eurasian J Emerg Med . 2009;8(3):21-24.
16. Bilgili MA, Öncü MR. Evaluation of Geriatric Patients Applying to the Emergency Department. Van Med J. 2021;28(1):77–83.
17. Yildiz S, Bİlgİlİ N. Acil servise başvuran yaşlı hastaların bireysel özellikleri ve başvurularının değerlendirilmesi evaluatıng ındıvıdual characterıstıcs and applıcatıons of elderly patıents presented to emergency servıce. Gazi Sağlık Bilim Derg. 2016;1(1):15-31.
18. Alhawas AY, Alaska Y, Almohaimede K, et al. To what extent the emergency physicians in Riyadh City are aware of patient radiation exposure from diagnostic ımaging requested in the emergency department. Cureus. 2020; 15;12(6):e8623. doi: 10.7759/cureus.8623
19. Durmuş E, Güneysu F. Acil Servis Hekimlerinin Bilgisayarlı Tomografi tetkikine yaklaşımlarının değerlendirilmesi. Klin Tıp Bilim. 2020 Aug 1;8(1):1–10.
20. Bellolio MF, Heien HC, Sangaralingham LR, et al. Increased Computed Tomography utilization in the emergency department and ıts association with hospital admission. West J Emerg Med. 2017;18(5):835–45.
21. Şengül H, Bulut A, Kaşikçi ÖH. Acil doktorları perspektifinden acil servisler: Bir İçerik Analizi Çalışması. Van Sag Bil Derg. 2020;13(3):55-66:12.
22. Eshıkumo IS. Acil hekimlerinin konsültasyon sürecinde yaşadıkları zorlukların değerlendirilmesi. Başkent Üniversitesi Tıp Fakültesi, Acil Tıp ABD, Tıpta Uzmanlık Tezi. 2017,37.
23. Karakuş V, Giden A, Soysal DE ve ark. Erişkin hastalarda anemi etiyolojisi, risk faktörleri ve nüksün değerlendirilmesi. MMJ. 2016; 3(1): 1-6.
24. Sarı İ, Altuntaş F. Transfüzyon ilkeleri ve erken komplikasyonlar. Türk Hematoloji Derneği - Hematolojide Destek Tedavileri Ve İnfeksiyonlar Kursu. 2007;64-77
25. Shenvi CL, Platts-Mills TF. Managing the Elderly Emergency Department Patient. Ann Emerg Med. 2019;73(3):302–7.
26. Adam P, Tejada JM, Malady D.An approach to the older patient in the emergency department. Clin Geriatr Med. 2018;34(3):299-311. doi: 10.1016/j.cger.2018.03.001
27. Singer AJ, Jr HCT, Viccellio P, et al. The Association Between Length of Emergency Department Boarding and Mortality. Acad Emerg Med. 2011;18(12):1324–9.
28. Pines JM, Hollander JE. Emergency department crowding ıs associated with poor care for patients with severe pain. Ann Emerg Med. 2008 Jan 1;51(1):1–5.
29. Shen Y, Lee LH. Improving the wait time to admission by reducing bed rejections. BMJ Open Qual. 2019;8(3):e000710.
30. Aydemİr İ. Bir Kamu Hastanesinde Yatak Kullanım Etkinliğinin Değerlendirilmesi. Usaysad Derg, 2019; 5(2):230-242:13.

CASE REPORT / OLGU SUNUMU

A Case of Cerebral Sinus Vein Thrombosis with Atypical Clinical Presentation

Atipik Klinik Prezentasyonlu Bir Serebral Sinüs Ven Trombozu Olgusu

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ABSTRACT

Aim: Cerebral sinus vein thrombosis (CVST) is a rare neurological disease. Although it can be seen in all age groups, it is most common in young women. Headache, focal neurological deficit, papilledema, nausea-vomiting are the main clinical symptoms. We wanted to present our case in order to emphasize that the clinical features are atypical, that there may be incidental dual pathologies during the diagnosis process, therefore each patient should be evaluated carefully, and that sinus vein thrombosis may present with different clinics.

Case: A 24-year-old female patient was admitted to the emergency department with the complaint of nausea and vomiting. Physical examination was normal. The patient, who had a history of appendectomy five days ago, was first evaluated in terms of acute abdomen, considering her complaints. Physical examination and other system examinations were normal. Her detailed neurological examination was normal due to the development of headache and diplopia in the right eye in the emergency department follow-up. In brain CT, hyperdensity was observed in the posterior of the right transverse sinus and superior sagittal sinus. Contrast-enhanced brain MR and cranial MR venography performed considering the possibility of CVST revealed an appearance consistent with a thrombus extending to the right transverse sinus posterior to the superior sagittal sinus. The patient was hospitalized and treated.

Conclusion: A significant portion of CVST has a better prognosis compared to arterial stroke due to the presence of wide anastomosis and collateral circulation. However, if it is not considered in the evaluation of the patient and the diagnosis is delayed, it can cause serious morbidity and mortality in a short time. Therefore, multidisciplinary approach is an important factor in early diagnosis of the disease when evaluating patients who apply to the emergency department.

Keywords: Headache, monocular diplopia, cerebral sinus vein thrombosis

ÖZ

Amaç: Serebral sinüs ven trombozu (SSVT) nadir görülen nörolojik bir hastalıktır. Tüm yaş gruplarında görülebilmekle birlikte en sık genç kadınlarda karşımıza çıkmaktadır. Baş ağrısı, fokal nörolojik defisit, papilödem, bulantı-kusma başlıca klinik semptomlardır. Olgumuzu klinik özelliklerinin atipik olması, tanı sürecinde insidental dual patolojilerin de olabileceği ve bu nedenle her hastanın özellikli olarak kendi içinde dikkatli değerlendirilmesi gerektiği ve sinüs ven trombozunun farklı kliniklerle karşımıza çıkabileceğinin vurgulanması amacıyla sunmak istedik.

Olgu: 24 yaşında kadın hasta bulantı kusma şikayeti ile acil servise başvurdu. Fizik muayenesi olağandı. Beş gün önce appendektomi öyküsü olan hasta, şikayetleri göz önüne alındığında öncelikle akut batın tablosu açısından değerlendirildi. Fizik muayenesi ve diğer sistem muayeneleri olağandı. Acil servis takibinde baş ağrısı ve sağ gözde diplopi şikayeti gelişmesi üzerine yapılan ayrıntılı nörolojik muayenesi normaldi. Beyin BT'de sağ transvers sinüs ve süperior sagital sinüs posteriorunda hiperdansite izlendi. SSVT olabileceği düşünülerek yapılan kontrastlı beyin MR ve beyin MR venografide süperior sagital sinüs posteriorunda sağ tranvers sinüse uzanan trombüs ile uyumlu görünüm saptandı. Hasta yatırılarak tedavisi düzenlendi.

Sonuç: SSVT'nin önemli bir bölümü geniş anastomoz ve kollateral dolaşımın varlığı nedeniyle arteriyel inme ile kıyaslandığında daha iyi seyirlidir. Ancak hastanın değerlendirilmesinde akla getirilmez ve tanıda gecikilirse kısa sürede ciddi morbidite ve mortaliteye neden olabilir. Bu nedenle acil servise başvuran hastalar değerlendirilirken multidisipliner olarak yaklaşılması hastalığın tanısının erken konulmasında önemli bir faktördür.

Anahtar Kelimeler: Baş ağrısı, monooküler diplopi, serebral sinüs ven trombozu

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Giriş

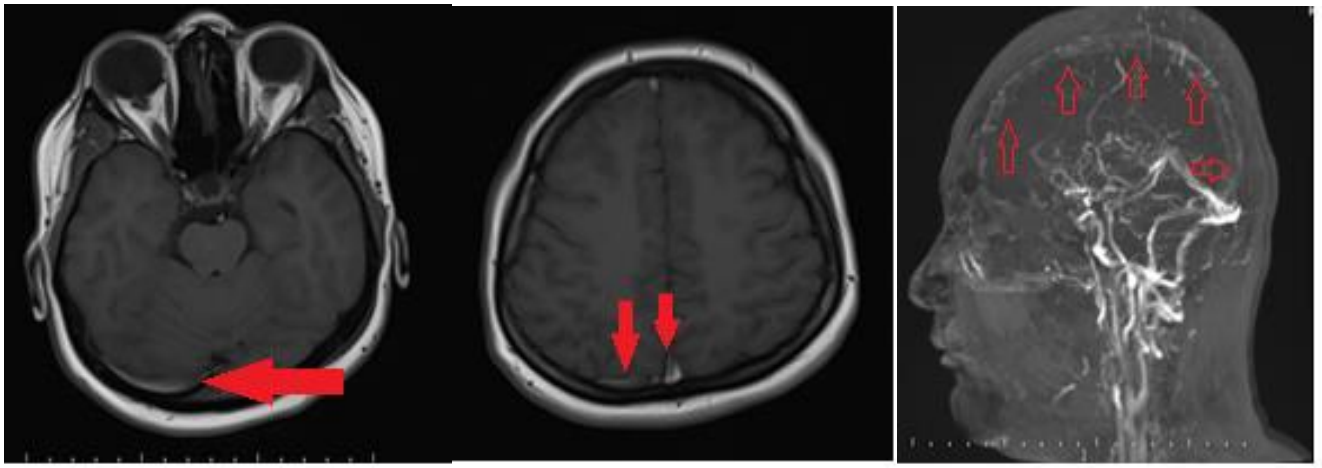
Serebral sinüs ven trombozu (SSVT), çok sık görülmeyen, akla getirilmez ve tanı konulamazsa mortal sonuçlara neden olabilen bir hastalıktır (1). Ancak ön tanı olarak akla getirilip tanı konulduğunda erken tedavide mortalite ve morbiditesi oldukça azaltılabilmektedir. Klinik semptom ve belirtileri çok değişken olduğu için tanısı oldukça zor olabilir. Her yaşta görülebilir ancak en çok genç erişkin yaşta ve kadınlarda erkeklere göre üç kat daha sık görülür (1,2). SSVT etiyolojisinde; gebelik, postpartum dönem, oral kontraseptif kullanımı, protein S-C ve antitrombin-3 eksiklikleri, tromboza yatkınlık yaratacak genetik mutasyonlar, intrakraniyal enfeksiyonlar, kraniyal tümörler, kafa travmaları, lomber ponksiyon, spinal anestezi, malignite, bağ dokusu hastalıkları, Behçet hastalığı, sarkoidoz, parenteral infüzyonlar ve çeşitli ilaçlar tanımlanmaktadır (3). Klinik prezentasyonlar oldukça farklılık gösterebilir ve bazı hastalarda atipik bulgular olabilir. Genellikle intrakranial hipertansiyona bağlı baş ağrısı, bulantı-kusma, papil ödem, fokal defisit, epileptik nöbet ve konfüzyon tablolarından birisiyle akut olarak başlar. Ancak subakut olarak yavaş gelişimli bir klinik seyri de olabilir (4). SSVT tanısında öncelikle klinik olarak tanıyı akılda tutmak önemlidir. Klinik şüphe olması halinde acil koşullarda beyin bilgisayarlı tomografi (BBT) görüntülemesi yapılmalıdır. BBT ile SSVT'den şüphelenildiğinde tanının kesinleştirilmesi için kontrastlı kraniyal manyetik rezonans (MR) ve MR venografi çekilmelidir (5). SSVT tedavisi etiyolojiye yönelik, semptomatik ve antikoagülan tedavidir. SSVT tablosunda bazı atipik prezentasyonlar ve ayrıca aynı hastada ortaya çıkabilecek insidental dual patoloji olması durumunda tanının konulması daha da zorlaşabilir. Özellikle akut klinik tablo ile acil servise başvuran hastalarda multidisipliner olarak hastayı değerlendirmek bu nedenle önem arz etmektedir. Bu yazıda; yakın zamanda abdominal cerrahi öyküsü olan, öncelikle bulantı-kusma şikayeti ile acil servise başvuran hastanın takiplerde baş ağrısı ve monooküler diplopisinin gelişmesi üzerine acil serviste akut batın tablosundan göz hastalıkları, santral sinir sistemi patolojisine kadar birçok açıdan değerlendirilen ve en son olarak SSVT tanısı konulan bir olgu sunulmaktadır.

Olgu Sunumu

24 yaşında kadın hasta bulantı kusma şikayeti ile acil servise başvurdu. Hastanın ilk değerlendirmesinde genel durumu iyi, bilinç açık koopere oryante idi. Vital bulgularında; kan basıncı: 130/75 mmHg, nabız: 97 atım/dk, solunum sayısı: 14/dk, ateş: 36,5°C olarak ölçüldü. Beş gün önce appendektomi öyküsü olduğu öğrenilen hasta, şikayetleri göz önüne alındığında acil serviste öncelikle akut batın tablosu açısından değerlendirildi. Fizik muayenesi ve diğer sistem muayeneleri olağandı. Ayrıntılı batın muayenesi olağandı ve sonrasında yapılan batın BT tetkiki normal saptandı. Kan tetkikleri olağandı. Acil servis takibinde tetkikleri yapılırken hastanın baş ağrısı ve sağ gözde diplopi şikayeti gelişmesi üzerine beyin BT yapıldı ve monooküler diplopi olması nedeniyle göz hastalıkları hekimince de göz muayenesi yapıldı. Göz muayenesinde göz dibi bakısında bilateral hafif papilödem, görme keskinliği sağda 0.5, solda 0.7 saptandı. Nörolojik muayenesi, sağ gözde diplopi tariflemesi dışında normaldi. Beyin BT'de sağ transvers sinüs ve süperior sagital sinüs posteriorunda hiperdansite izlendi (Şekil-1).

Şekil-1: Beyin BT'de superiorsagital sinüs posteriorundan sağ tranvers sinüse uzanan trombüs ile uyumlu hiperdansite (delta belirtisi)

Hastaya sinüs ven trombozuna yönelik yapılan kontrastlı beyin MRG ve beyin MR venografide süperior sagital sinüs posteriorunda sağ tranvers sinüse uzanan trombüs ile uyumlu görünüm saptandı **(Şekil-2 a,b,c)**. Özgeçmişi sorgulandığında oral kontraseptif dahil herhangi bir ilaç kullanım öyküsü ve bilinen başka hastalık tanısı, yakın zamanda geçirilmiş otit, mastoidit gibi enfeksiyon, kafa travması ve spinal anestezi öyküsü yoktu. Soygeçmişinde özellik yoktu. Hasta sinüs ven trombozu tanısıyla nöroloji kliniğine yatırıldı. Antikoagüle edildi ve kafa içi basınç artışı semptomları olması sebebiyle diazomid tedavisi başlandı. SSVT etiyolojisine yönelik yapılan kan tetkiklerinde ve genetik analizde homosistein düzeyi: 33 mikromol/L ve MTHFR A198C homozigot mutasyonu saptandı. Diğer etiyolojik tetkikler (vaskülit markerları, protein C-S, antitrombin-3, antifosfolipid ve antikardiyolipin antikoru, biyokimya, hemogram, CRP, demir parametreleri, tiroid fonksiyon testleri) normaldi. İzlemde şikayetleri gerileyen hastaya yapılan kontrol beyin MR venografide rekanalizasyon olduğu tespit edilmesi üzerine hasta tedavisi düzenlenerek taburcu edildi. Hastadan tıbbi verilerin yayımlanacağına ilişkin yazılı onam belgesi alındı.



Şekil-2: a ve b) T1 sekansta superior sagital sinüs posteriorundan sağ tranvers sinüse uzanan trombüsün hiperintens görünümü,
c) Kontrastlı beyin mr venografide superior sagital sinüsteki dolum defekti

Tartışma

Serebral sinüs ven trombozu (SSVT) akut ya da subakut ortaya çıkabilen ve farklı klinik tablolarla prezente olabilen nörolojik bir hastalıktır (1). Tanısı erken konulduğunda ciddi oranda morbidite ve mortalite azalır. İnsidansı yılda 0,2-1,2/100.000 olgudur (2).İskemik inmelerin büyük çoğunluğu arteriyel kökenlidir, venöz kökenli inmeler ise tüm inmelerin sadece %1'ini oluşturur (2) . Kadınlarda erkeklere oranla üç kat ve her yaşta görülmekle birlikte genç erişkinlerde daha fazla görülür (3).

En sık görülen semptom %40 oranla baş ağrısıdır. Ayrıca epileptik nöbet (%27), fokal nörolojik defisit (%5), papilödem (%30-80), izole intrakraniyal hipertansiyon, bulantı-kusma, afazi, ihmal, görme alanı defekti de görülebilen diğer semptomlardır (4). Trombozun olduğu sinüs lokalizasyonu kliniğin oluşmasında belirleyici faktördür. En sık superior sagittal sinüs (SSS) trombozu görülür (5). SSS trombozunda intrakraniyal basınç artışına bağlı baş ağrısı ve papilödem ön plandadır. Bizim olgumuzda da baş ağrısı, papil ödem ve kafa içi basınç artışına bağlı bulantı-kusma mevcuttu. Transvers sinüs trombozunda kraniyal sinir tutulumları, mastoid bölgede ve kulakta ağrı, kulak enfeksiyonu bulguları görülebilir. Kavernöz sinüs trombozunda okülomotor paralizi ve orbital ağrı görülebilir. Kortikal ven tutulumuna bağlı trombozda ise homonim hemianopsi, kontralateral güçsüzlük, epileptik nöbet ve afazi görülebilir (5,6,7).

SSVT etiyolojisinde; gebelik, postpartum dönem, oral kontraseptif kullanımı, koagülopatiler, kalıtsal trombofilik hastalıklar, intrakraniyal enfeksiyonlar, kraniyal tümörler, kafa travmaları, lomber ponksiyon, spinal anestezi, malignite, bağ dokusu hastalıkları, Behçet hastalığı, nörocerrahi ve çeşitli ilaçlar tanımlanmaktadır (3). Spinal anestezi nadir risk faktörlerinden biridir. Lumbal ponksiyon sonrasında olguların %0.2-3.5'sinde SSVT geliştiği bildirilmiştir (8). Olgumuzun yakın zamanda appendektomi öyküsü olmakla birlikte genel anestezi altında operasyonun yapıldığı, lomber ponksiyon öyküsü olmadığı öğrenildi. Literatürde nörocerrahi sonrası gelişen SSVT olguları bildirilmiş olmakla birlikte, yaptığımız literatür taramaları sırasında batın cerrahisine bağlı olduğu belirlenen olguya rastlanmamıştır ve bu nedenle etiyolojik faktörler arasında sayılmamıştır. Olgumuzda, homozigot MTHFR gen mutasyonu ve artmış homosistein düzeyinin SSVT etiyolojisine neden olduğu düşünülmüştür.

Bilgisayarlı beyin BT acil servislerde de ulaşım kolaylığı açısından en yaygın kullanılan ve yapılması gereken ilk görüntüleme yöntemidir. Beyin BT'de rastlanılabilecek en önemli bulgu tromboze kortikal venin veya dural sinüsün hiperdens görünümüdür. Superior sagittal sinüsün posterior kısmının trombozu, kontrastsız beyin BT'de sinüsün hiperdens görülmesine yol açar ve bu bulguya "delta belirtisi" denir. Olguların %20'sinde ise beyin BT normal saptanabilmektedir (5).Bizim olgumuzun BBT'sinde de delta belirtisi ile uyumlu görünüm mevcuttu. Günümüzde en temel tanı yöntemi ise beyin MR ve MR venografidir. Sinüsün tromboze olup olmadığı T1, T2 ve FLAIR incelemelerde sinüs trasesi içinde trombüsün dönemine göre değişebilen izointens ya da hiperintens sinyal değişikliğinin izlenmesi ile anlaşılabilir. MR venografi de trombozun olduğu sinüs lokalizasyonunda dolum defekti saptanır (9).

SSVT tedavisi etiyolojiye yönelik, semptomatik ve antikoagülan tedavidir (10). Olgumuzda tedavi olarak düşük molekül ağırlıklı heparin ve sonrasında varfarin tedavisi uygulanmış olup kafa içi basınç artışına yönelik de diazomid tedavisi verilmiştir.

Sonuç

SSVT'nın önemli bir bölümü geniş anastomoz ve kollateral dolaşımın varlığı nedeniyle arteriyel inme ile kıyaslandığında daha iyi seyirlidir (11). Ancak hastanın değerlendirilmesinde akla getirilmez ve tanıda gecikilirse kısa sürede ciddi morbidite ve mortaliteye neden olabilir. Semptomlarının ve klinik bulgularının oldukça geniş bir yelpazesi ve atipik kliniklerle prezentasyonlarının da olması sebebiyle tanı

konulmasında gecikmeler yaşanabilen nörolojik bir hastalıktır. Bunun yanı sıra olgumuzda olduğu gibi acil servise başvuran hastalarda insidental olarak benzer semptomlarla kendini gösterebilen dual iki patolojik tablonun bulunması tanı karmaşasına ve gecikmesine daha çok neden olabilir. Bu nedenle acil servise başvuran hastalar değerlendirilirken multidisipliner olarak yaklaşılması hastalığın tanısının erken konulmasında önemli bir faktördür. Olgumuzda da acil servis başvurusu sırasında ilk semptomun bulantı-kusma olması ve yakın zamanda batın operasyonu öyküsü olması öncelikli olarak tıbbi değerlendirmenin bu yönde ilerlemesine neden olmuştur. Ancak acil servis hekimlerinin yakın gözlemleri neticesinde hastanın yeni bulguların geliştiği tespit edilmiş ve tekrar yapılan değerlendirmeler sonrasında hastanın tanısı çok gecikmeden konulabilmiştir. Olgumuzun monooküler diplopi gibi bir atipik bir klinik prezentasyonunun olmasından yola çıkarak acil servis ve nöroloji hekimlerinde farkındalık oluşturması açısından olgumuz sunulmaya değer görülmüştür.

Çıkar Çatışması: Bu çalışma ile ilgili olarak yazarların ve/veya aile bireylerinin çıkar çatışması potansiyeli olabilecek bilimsel ve tıbbi komite üyeliği veya üyeleri ile ilişkisi, danışmanlık, bilirkişilik, herhangi bir firmada çalışma durumu, hissedarlık ve benzer durumları yoktur.

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Yazarlık Katkısı: BD; cerrahi ve medikal uygulama, konsept, dizayn, analiz veya yorumlama, literatür arama, makalenin yazımında; SÖ; konsept, veri toplama, analiz ve yorumlama, literatür taramasında görev almıştır.

Hasta Onamı: Bu olgu sunumunun ve eşlik eden görüntülerin yayınlanması için hastadan yazılı bilgilendirilmiş olur alınmıştır. Yazılı iznin bir kopyası bu dergide incelenmek üzere mevcuttur.

References

1.Stam J. Thrombosis of the cerebral veins and sinuses. N Engl J Med 2005;352:1791-1798.

2. Bousser MG, Ferro JM. Cerebral venous thrombosis: an update. LancetNeurol 2007;6:162-170.

3. Starrfelt R, Shallice T. What's in a name? The characterization of pure alexia. CognNeuropsychol 2014;31(5-6):367–77.4.Kimber J. Cerebral venous sinus thrombosis. QJM 2002;95(3):137-42.

4. Kimber J. Cerebral venous sinus thrombosis. QJM 2002;95(3):137-42.

5. Boukobza M, Crassard I, Bousser MG. When the "dense triangle" in dural sinüs thrombosis is round. Neurology 2007;69:808.

6. Sakaida H, Kobayashi M, Ito A, et al. Cavernous sinus thrombosis: linking a swollen red eye and headache. Lancet 2014;384:928.

7. Smith DM, Vossough A, Vorona GA, et al. Pediatric cavernous sinus thrombosis: A case series and review of theliterature. Neurology 2015;85:763-769.

8. Milhaud D, Heroum C, Charif M, et al. Dural puncture and corticotherapy as risks factors for cerebral venous sinus thrombosis. Eur J Neurol 2000;7:123-4.

9. Masuhr F, Mehraein S, Einhaupl K. Cerebral venous and sinus thrombosis. J Neurol 2004;251:11-23

10. Einhaupl K, Stam J, Bousser MG, et al. EFNS guideline on the treatment of cerebral venous and sinus thrombosis in adult patients. Eur J Neurol 2010;17(10):1229-35

11. Dentali F, Gianni M, Crowther MA, et al. Natural history of cerebral vein thrombosis: A systematic review. Blood 2006;108(4):1129-34.

CASE REPORT / OLGU SUNUMU

Flank Abscess After Perforated Acute Appendicitis

Perfore Akut Apandisit Sonrası Gelişen Flank Absesi

Tolga Kalaycı[1]

ABSTRACT

Aim: Abscess after appendectomy is an important problem. However, there was no case of flank abscess after appendectomy in literature. In this case report, we wanted to present a case of flank abscess due to perforated appendicitis.

Case: A 65-year-old male patient presented to the emergency department with complaints of abdominal pain and fever. The patient was diagnosed with acute appendicitis during the evaluation in the emergency department, and emergency surgery was planned for the patient. During laparoscopic exploration, perforation was observed in the middle part of the appendix. The patient underwent laparoscopic appendectomy. Abdominal ultrasonography (USG) was performed on the patient since there was no regression in the patient's infective parameter values in the postoperative service follow-up. No pathology (abscess or fluid collection) was observed in the USG evaluation. Computed tomography (CT) was performed as the patient's infective blood parameters continued to increase. CT scan showed a 70*50 mm abscess in the right flank without intra-abdominal abscess. Abscess drainage was performed with a right flank incision under sedation. All laboratory parameters returned to normal on the 14th postoperative day, and the patient was discharged without complications.

Conclusion: Flank abscess after appendectomy is a very rare condition. The diagnosis of flank abscess should be kept in mind in patients who underwent appendectomy due to perforated appendicitis and whose infective blood parameters continue to be elevated in the follow-up.

Keywords: Abscess, appendectomy, drainage, laparoscopy

ÖZ

Amaç: Apendektomi sonrası apse önemli bir problemdir. Ancak literatürde apendektomi sonrası flank apse vakasına rastlanılmamıştır. Bu olgu sunumunda perfore apandisit nedeniyle gelişen bir flank apse olgusunu sunmak istedik.

Olgu: 65 yaşında erkek hasta karın ağrısı ve ateş şikâyeti ile acil servise başvurdu. Acil serviste yapılan değerlendirmede hastaya akut apandisit tanısı konuldu ve acil cerrahi planlandı. Laparoskopik eksplorasyon sırasında apendiksin orta kısmında perforasyon izlendi. Hastaya laparoskopik apendektomi uygulandı. Postoperatif servis takibinde hastanın enfektif parametre değerlerinde gerileme olmadığı için hastaya karın ultrasonografisi (USG) yapıldı. USG değerlendirmesinde herhangi bir patoloji (apse veya sıvı toplanması) gözlenmedi. Hastanın enfektif kan parametrelerinin artmaya devam etmesi üzerine, bilgisayarlı tomografi (BT) çekildi. BT'de karın içi apsesi olmaksızın sağ flankta 70*50 mm apse görüldü. Sedasyon altında sağ flank insizyonu ile apse drenajı yapıldı. Ameliyat sonrası 14. günde tüm laboratuvar parametreleri normale dönen hasta komplikasyonsuz taburcu edildi.

Sonuç: Apendektomi sonrası flank apsesi çok nadir görülen bir durumdur. Perfore apandisit nedeniyle apendektomi yapılan ve takipte enfektif kan parametreleri yükselmeye devam eden hastalarda flank apse tanısı akılda tutulmalıdır.

Anahtar Kelimeler: Abse, apendektomi, drenaj, laparoskopi

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Introduction

Acute appendicitis (AA) is the most common cause of acute abdomen in patients of all age groups presenting to the emergency department (1). The symptoms and physical findings of the patients are mostly diagnostic. Laboratory findings such as white blood cell (WBC) count, leukocyte count, C-reactive protein (CRP) level and imaging tools such as ultrasonography (USG), computed tomography (CT) and magnetic resonance imaging (MRI) are helpful in confirming the diagnosis of AA. If the diagnosis cannot be made despite these additional examinations and the diagnosis of AA is still suspected, diagnostic operations can be applied as last remedy (2).

As with any disease, early diagnosis of AA is important. Because, depending on the delay in diagnosis, the probability of appendiceal perforation increases. In the literature, there is a morbidity rate of up to 10% and a mortality rate of up to 5% for AA. Studies have shown that early appendectomy reduces the risk of perforation and surgical site infections (3, 4). In addition, the delay in the application of appendectomy affects both the possibility of intra-abdominal abscess and postoperative complications (5). However, there are studies in the literature showing that delayed appendectomy does not affect morbidity (6, 7).

Complicated appendicitis is defined as perforated appendicitis, peri appendicular abscess, or peritonitis. These diagnoses are tried to be determined with imaging tools such as USG and CT (8). In some cases, the diagnosis cannot be made immediately, and repeated examinations and tests are required.

In this case report, we wanted to present a case of flank abscess that developed after perforated appendectomy and its treatment.

Case Report

A 65-year-old male patient presented to the emergency department of Erzurum Regional Education and Research Hospital in October 2019 with complaints of abdominal pain, nausea and vomiting for two days. The patient had no history of surgery and only had hypertension. On evaluation, vital findings of the patient were as follows: blood pressure: 124/75 mm Hg, pulse rate: 118 beats per minute, oxygen saturation on room air: 95% and body temperature: 38.3° Celsius. On physical examination of the abdomen, there was tenderness and rebound in the right upper and lower quadrants.

There was no laboratory pathology except for C-reactive protein (CRP) elevation (31 mg/L) and leukocyte count elevation (25.1x10^3/mm^3). Computed tomography showed an appendix with a diameter of 12 mm (Figure 1) and paracolic inflammation with suspicious abscess (Figure 2 and 3). Laparoscopic surgery was planned for the patient. Purulent fluid was present in both the Douglas's pouch and the right lower abdomen during exploration. In addition, perforation was observed in the middle part of the appendix. The appendix and all necrotic tissues surrounding the appendix were removed from the abdomen with a glove bag. One drain was placed in the paracolic region and the other in the pelvic cavity.

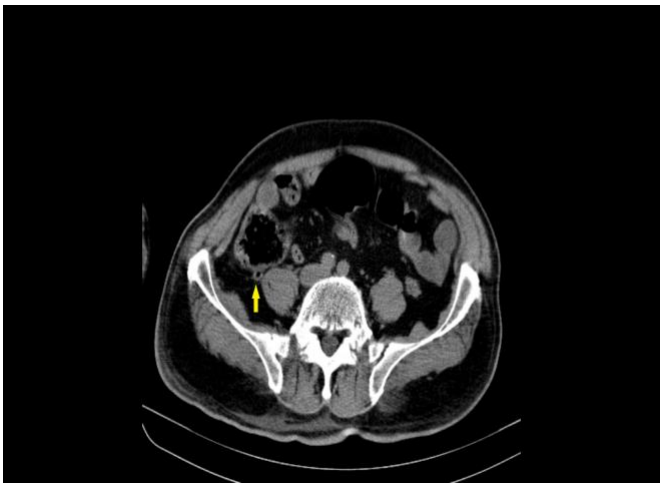

Figure 1: CT scan showed enlarged 12mm diameter appendix tissue with an intact radix.

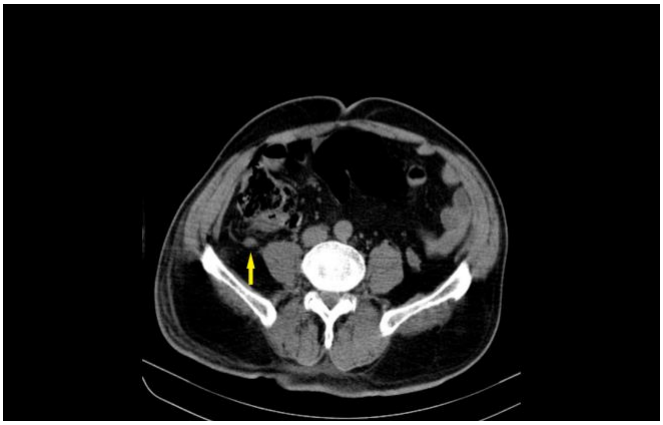

Figure 2. On CT scan, there was enlarged appendix tissue with peri-appendicular inflammation.

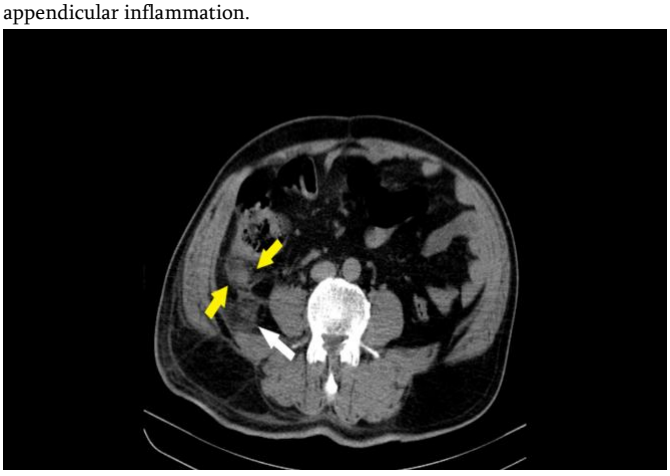

Figure 3. Two yellow arrows show distal part of the appendix, while white arrow shows inflamed retro-Toldt's fascia.

The patient was followed up in the service in the postoperative period. Intravenous ertapenem 1 gram (one vial per day) started. Oral intake was started at the postoperative 6th hour. On the fifth postoperative day, CRP value (25 mg/L) and leukocyte count (19.1x10^3/mm^3) were

still high, but there was no fluid coming from the drains. Therefore, abdominal USG was performed on the patient and no pathology (abscess or fluid collection) was observed. All drains were removed on the sixth postoperative day. CRP level (27.2 mg/L) and leukocyte count ($18x10^3/mm^3$) were still high on the seventh postoperative day. Therefore, contrast-enhanced abdominal CT was planned for the patient. CT scan revealed a 70*50 mm abscess on the right flank without intra-abdominal abscess (Figure 4 and 5). The flank abscess drainage was performed under sedation. Abscess material was studied for culture and antibiogram. Since *Enterococcus faecalis* grew in the antibiogram and was sensitive to ertapenem, the current antibiotherapy was continued. Daily wound cleaning was performed with rifamycin 125 milligram/1.5 millimeter vial (every 12 hours) and 3% hydrogen peroxide. Intravenous ertapenem treatment was completed to 14 days. The patient was discharged when all laboratory parameters were normal [CRP level (1.2 mg/L) and leukocyte count ($7.6x10^3$ / mm^3)] on the postoperative day 14. The flank incision left to secondary healing. The wound was closed on the 15^{th}day after discharge. No pathology was detected in the control of the patient in the first month after discharge. Written informed consent was obtained from the patient for publication of this case.

Figure 4. There was no inflammatory area in the abdominal cavity postoperatively.

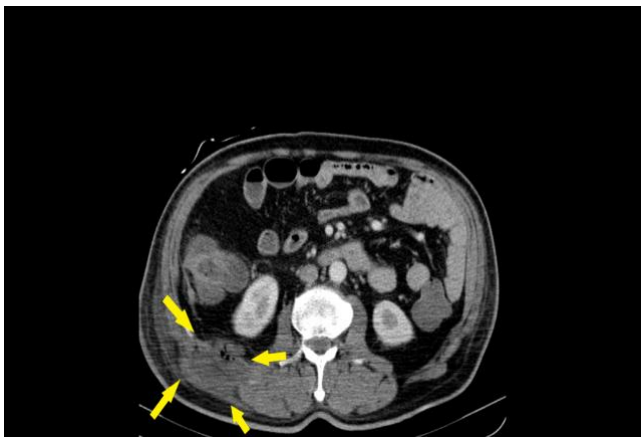

Figure 5. CT scan shows a right flank abscess of 70 * 50 mm in size.

Discussion

Acute appendicitis (AA) is the most common cause of acute abdomen (9). The clinical picture of AA starts with visceral peritoneal sensitivity and with increasing inflammation, parietal peritoneal sensitivity is added to the clinical picture. Although there is no definite localization of the pain at the beginning, the pain usually progresses to the right lower quadrant with increasing parietal peritoneal inflammation.

Most patients present to emergency services with a typical history and physical examination. While laboratory tests and imaging tools help to diagnose in most patients, acute appendicitis cannot be diagnosed in a small number of patients despite all the tests. If the diagnosis cannot be made despite these additional tests and the diagnosis of AA is still suspected, diagnostic procedures should be performed as last remedy (2).

In case of delay in the diagnosis of AA or in the operation to be performed, both morbidity and mortality increase. Abdominal abscess rate increases in delayed cases. Abscess formations can be seen in the retroperitoneal region and between muscle fibers outside the abdomen (10). Retroperitoneal abscess formation can be a serious complication of AA, which confronts physicians with difficult diagnosis and early treatment due to its insidious onset and various problems. Retroperitoneal abscess formation can occur anywhere in the retroperitoneum, including the psoas muscle with possible extension to the thigh (11). Infection can pass through Toldt's fascia and abscess can be seen between the abdominal lateral muscles, as in our study. In this case report, a rare case of abscess developing after appendectomy is presented.

Post-appendectomy intra-abdominal abscesses are estimated to complicate up to 4.2% of acute non-perforated appendicitis cases and 6.7% to 28% of acute perforated appendicitis cases (12). Laparoscopic appendectomy has been shown to be safe and effective for acute appendicitis, but a higher rate of intra-abdominal abscess has been reported in laparoscopic appendectomy compared to open appendectomy (13). In studies, predisposing factors in adults for post-appendectomy intra-abdominal abscess were as follows: perforated appendicitis, CRP greater than 200 mg/L, leukocyte greater than $17x10^3/mm^3$ (14). In the presence of intra-abdominal abscess, length of hospital stay, rate of readmission and re-intervention increase. Most cases of abdominal abscess are treated medically with antibiotics. However, in some cases, an abdominal abscess needs to be drained with a catheter or re-operated. Our patient had leukocytosis (over $17x10^3/mm^3$) and perforated appendicitis, which are high risk factors. However, intra-abdominal abscess did not develop in the patient during the follow-up.

Percutaneous drainage catheter is also an option in the treatment of patients who develop flank abscess after

appendectomy. However, due to the lack of technical facilities of the hospital, abscess drainage was applied to the patient.

Conclusion

In conclusion, flank abscess after appendectomy is a very rare condition. The diagnosis of flank abscess should be kept in mind in patients who underwent appendectomy due to perforated appendicitis and whose infective blood parameters continue to be elevated in the follow-up. In appropriate cases, interventional drainage should be tried as first-line treatment. However, as in our case, re-surgery has a place in the treatment of flank abscess due to technical impossibilities. Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

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Financial Disclosure: No financial disclosure was declared by the authors.

Authors Contribution: TK contributed to designing the study and preparation of the manuscript.

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.

References

1. Yeni M, Peksöz R, Dablan A, et al. A rare acute abdomen case: Acute appendicitis in the patient with situs inversus totalis. J Surg Med. 2019;3(10):766-8.
2. Ahmed HO, Muhedin R, Boujan A, et al. A five-year longitudinal observational study in morbidity and mortality of negative appendectomy in Sulaimani teaching Hospital/Kurdistan Region/Iraq. Scientific reports. 2020;10(1):1-7.
3. Ditillo MF, Dziura JD, Rabinovici R. Is it safe to delay appendectomy in adults with acute appendicitis? Annals of surgery. 2006;244(5):656.
4. Busch M, Gutzwiller FS, Aellig S, et al. In-hospital delay increases the risk of perforation in adults with appendicitis. World journal of surgery. 2011;35(7):1626-33.
5. Papandria D, Goldstein SD, Rhee D, et al. Risk of perforation increases with delay in recognition and surgery for acute appendicitis. Journal of Surgical research. 2013;184(2):723-9.
6. Almström M, Svensson JF, Patkova B, et al. In-hospital surgical delay does not increase the risk for perforated appendicitis in children. Annals of surgery. 2017;265(3):616-21.
7. Yardeni D, Hirschl RB, Drongowski RA, et al. Delayed versus immediate surgery in acute appendicitis: do we need to operate during the night? Journal of pediatric surgery. 2004;39(3):464-9.
8. Mariage M, Sabbagh C, Grelpois G, et al. Surgeon's Definition of Complicated Appendicitis: A Prospective Video Survey Study. Euroasian journal of hepato-gastroenterology. 2019;9(1):1.
9. Kotan Ç, Köseoğlu B, Barut İ, et al. The Comparison of Clinical Features of Acute Appendicitis in Childs, Adults and Elderly Population. Van Medical Journal.7(4):133-7.
10. Moslemi S, Tahamtan M, Hosseini SV. A late-onset psoas abscess formation associated with previous appendectomy: a case report. Bulletin of Emergency & Trauma. 2014;2(1):55.
11. Hsieh C-H, Wang Y-C, Yang H-R, et al. Retroperitoneal abscess resulting from perforated acute appendicitis: analysis of its management and outcome. Surgery today. 2007;37(9):762-7.
12. Coelho A, Sousa C, Marinho A, et al. Post-appendectomy intra-abdominal abscesses: six years' experience in a Pediatric Surgery Department. Cirugia pediatrica: organo oficial de la Sociedad Espanola de Cirugia Pediatrica. 2017;30(3):152-5.
13. Sauerland S, Jaschinski T, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database of Systematic Reviews. 2010(10).
14. Levin DE, Pegoli W. Abscess after appendectomy: Predisposing factors. Advances in surgery. 2015;49(1):263-80.

CASE REPORT / OLGU SUNUMU

A Rare Cause of Chest Pain: Spontaneous Pneumomediastinum

Göğüs Ağrısının Nadir Bir Nedeni: Spontan Pnömomediastinum

Özgür Önen[1], Sercan Aydın[2], Miraç Koç[3], Fatma Mutlu Kukul Güven[3]

ABSTRACT

Aim: Spontaneous pneumomediastinum (SPM) is the presence of free air in the mediastinum without any clear reason. It is a rare, self-limiting disease that occurs mostly in young men. Although radiographic imaging is usually sufficient for the diagnosis, thoracic computed tomography may be required in suspicious cases and to determine the etiology. The conservative approach is sufficient in the treatment.

In this report, we present a 23-year-old male patient who presented to the emergency department due to chest pain and was diagnosed with spontaneous pneumomediastinum.

Case: 23-year-old male patient presented to the emergency department with chest pain. His general condition was good, and he was conscious. Systemic physical examination and electrocardiogram were normal. Free air was detected in the paratracheal area on the posteroanterior (PA) chest X-ray. He was admitted to the thoracic surgery service for follow-up and treatment with the diagnosis of pneumomediastinum.

Conclusion: Spontaneous pneumomediastinum should definitely be considered in the differential diagnosis of young patients presenting to the emergency department with chest pain. Clinical suspicion is the most valuable step for the diagnosis of spontaneous pneumomediastinum. Although PA chest X-ray is mostly sufficient for diagnosis, thoracic computed tomography is necessary to determine the etiology and follow-up.

Keywords: Pneumomediastinum, emergency department, chest pain

ÖZ

Amaç: Spontan pnömomediastinum (SPM), kesin bir neden olmaksızın mediastende serbest hava bulunmasıdır. Çoğunlukla genç erkeklerde, nadir görülen, kendi kendini sınırlayan bir hastalıktır. Tanı için genellikle radyografik görüntüleme yeterli olmakla birlikte, şüpheli durumlarda ve etiyolojiyi belirlemek için toraks bilgisayarlı tomografi gerekebilir. Tedavide konservatif yaklaşım yeterlidir.

Bu yazıda göğüs ağrısı nedeniyle acil servise başvuran ve spontan pnömomediastinum tanısı konulan 23 yaşında erkek hasta sunuldu.

Olgu: 23 yaşında erkek hasta göğüs ağrısı şikayeti ile acil servise başvurdu. Genel durumu iyi, bilinci açıktı. Sistemik fizik muayene ve elektrokardiyogram normaldi. Posteroanterior (PA) akciğer grafisinde paratrakeal alanda serbest hava tespit edildi. Pnömomediastinum tanısıyla takip ve tedavi amacıyla göğüs cerrahisi servisine yatırıldı.

Sonuç: Acil servise göğüs ağrısı ile başvuran genç hastaların ayırıcı tanısında spontan pnömomediastinum mutlaka düşünülmelidir. Spontan pnömomediastinum tanısı için klinik şüphe en değerli adımdır. PA akciğer grafisi çoğunlukla tanı için yeterli olsa da etiyolojiyi belirlemek ve takip için toraks bilgisayarlı tomografi gereklidir.

Anahtar Kelimeler: Pnömomediastinum, acil servis, göğüs ağrısı

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Introduction

Pneumomediastinum is defined as the presence of free air in the mediastinum (1-2). It is divided into two groups as spontaneous pneumomediastinum (SPM) and secondary pneumomediastinum (ScPM). SPM occurs in healthy patients with unknown primary cause, usually after Valsalva maneuver, vomiting, or excessive coughing, while ScPM results from trauma, intrathoracic infections, or iatrogenic causes (1,3). SCM is a disease with a generally good prognosis, mostly in young men, characterized by chest pain and cough (4-5). Radiographic imaging is initially preferred for the diagnosis, while computed tomography (CT) should be preferred in suspicious cases and to determine the etiology. Conservative approaches such as resting and analgesia are usually sufficient for the treatment (5-6).

In this report, we present a 23-year-old male patient who presented to the emergency department with sudden onset chest pain during breathing and was diagnosed with spontaneous pneumomediastinum. We aimed to draw attention to and raise awareness of spontaneous pneumomediastinum, which is likely to be missed, especially in young patients who present to the emergency departments with chest pain during rush hours.

Case Report

23 year-old healthy male was admitted to the emergency department with chest pain that started three hours ago. His medical history revealed that the pain started during resting. He had no cough, nausea/vomiting, a history of trauma, was not using a medication, and had not undergone previous intervention. General status of the patient was good, with open consciousness, and Glasgow Coma Scale (GCS) was evaluated as 15. The blood pressure of the patient was measured as 110/70 mm/Hg, respiratory rate as 16/min, pulse as 98/min, and oxygen saturation (SpO_2) as 98%. Electrocardiogram (ECG) showed normal sinus rhythm and there was no change in ST-T wave. The physical exam was unremarkable. Laboratory parameters were in the normal range. Figure 1 shows free air areas in the paratracheal region on the posterior-anterior chest X-ray. Figure 2 shows free air areas on thoracic CT.

The patient was consulted to the department of thoracic surgery with the preliminary diagnosis of pneumomediastinum, and he was admitted to the thoracic surgery ward for follow-up and treatment. Only analgesics were given for the treatment of chest pain. Complaints of the patients regressed at the follow-up, pneumomediastinum areas regressed in control radiographs, and the patient was discharged on the third day of hospitalization. Written informed consent was obtained from the patient for publication of this case report

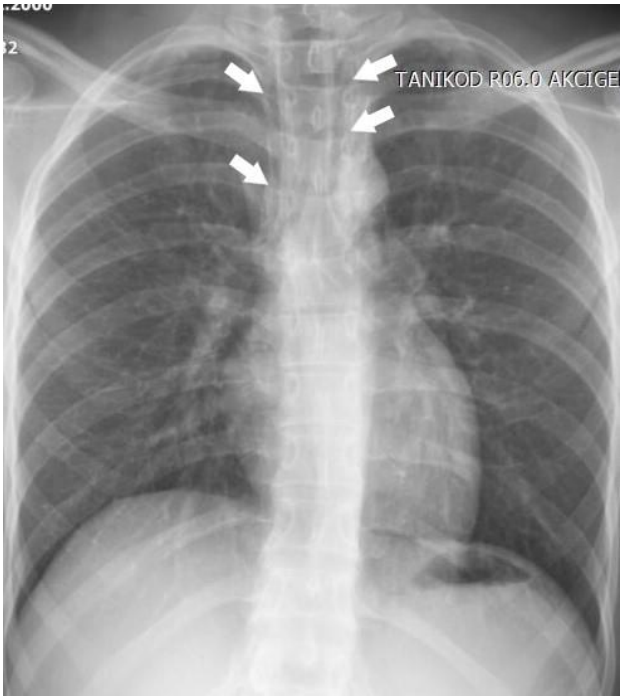

Figure 1: View of free air as a linear band in the paratracheal area in the mediastinum (white arrow).

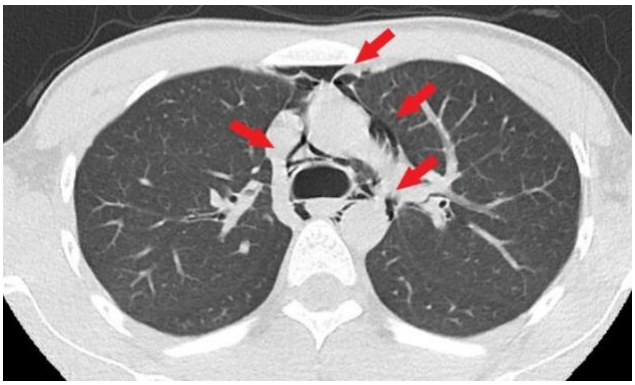

Figure 2: Air images seen anteriorly in the retrosternal region and extending between the pericardial leaves. Mediastinal air images extend through the retropharyngeal space to deep neck level (red arrow)

Discussion

SPM is usually seen as a result of air leaking into the mediastinum due to alveolar rupture in bronchovascular structures because of suddenly increased intrathoracic pressure. Although there are triggers such as cough, vomiting, and heavy physical activity, SPM can also occur independently of these factors. Lung disease or smoking can predispose to this condition (1,5,7-8). Studies have found facilitating factors at different rates (1,9). In a study by Caceres M et al., it was stated that these rates vary according to the physicians who make the inquiry (1). In our case, no facilitation or predisposing factor was found.

The most common symptom in patients with SPM is chest pain, seen in about three-quarters of patients. In addition, nearly half of the patients may have a cough and one-third neck pain (1,5,8). In a study by Khadija C et al., the most common symptom was found as chest pain in 75% of the patients (5). In another study by Caceres M et al., the most

common causes of presentation were found as chest pain, dysphagia and subcutaneous emphysema (1). In addition, it has been reported that mediastinitis due to rupture of the gastrointestinal tract, which is a therapeutic emergency, should also be considered if the patient has symptoms such as dyspnea, dysphagia and fever (5,8). In our case, the patient presented to the emergency department with only chest pain and no other features were detected.

Radiological examinations of the thorax are important in the evaluation and exclusion of secondary causes and are sufficient to confirm the diagnosis (10). The diagnosis of pneumomediastinum can be made with standard posteroanterior and lateral chest radiographs (11). About 70% to 90% of SPM cases can be identified by chest X-ray (12). Radiological signs depend on the quantity and location of the air (13). In the study of Caceres M et al., it is stated that chest radiography (93%) is preferred more than computed tomography (71%) in the diagnosis of pneumomediastinum (1). In a study from Turkey, it was reported that chest radiography (25.8%) is much less preferred than tomography (74.2%) (14). In a study by Fitzwater JW et al., no change was made in the treatment according to the results of thoracic CT taken after radiographic imaging and there was no need for referral to a higher center (8). In a study by Koullias GJ et al., it was stated that all patients should undergo radiographic imaging and CT (15). In addition, it has been stated in other studies that radiographic imaging can be reported as normal in one third of the cases (1,6). Therefore, thoracic CT should be performed in suspicious cases in order to establish the correct diagnosis and determine the etiology. By this way, existing lung pathologies can also be revealed (3,6). In our case, pneumomediastinum was detected in posterior-anterior chest X-ray and CT was then performed to reveal the etiology.

SPM is a disease with a good prognosis that occurs as a result of free air entering the blood circulation within 48-96 hours and regresses spontaneously in approximately 3-4 days. Conservative approaches such as resting, analgesics, oxygen therapy, bronchodilator, or steroids (in asthmatic patients) are in general sufficient for the treatment (3,5,8). The use of prophylactic antibiotics use and restriction of oral intake are not recommended (7). It has been stated that primary surgical repair can be performed in severe cases, and patients with acute respiratory distress can be intervened through tracheostomy, skin incisions over the neck and anterior chest wall (3,5,8). In a study by Dajer-Fadel WL et al., it was emphasized that recognition of clinical data is extremely important in order to choose the best method between conservative approach and life-saving surgical approach in the case of SPM (2). In our case, only analgesics were given as the symptomatic treatment after the patient was admitted to the ward, and he was discharged on the third day of hospitalization without a need for additional treatment since complaints of the patients regressed, and pneumomediastinum areas regressed in control radiographs. Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Conclusion

In conclusion, SPM is a rare disease mostly seen in young men. A high level of suspicion is needed for the diagnosis, because the disease occurs without triggering factors in some patients and can be missed in radiographic imaging in about one third of the patients. Therefore, CT should be ordered in suspicious cases and to investigate the etiology. SPM should be kept in mind among differential diagnoses of chest pain especially in young male patients presenting to emergency departments.

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Authors Contribution: All authors contributed equally to the preparation of this article.

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.

References

1. Caceres M, Ali SZ, Braud R, et al. Spontaneous Pneumomediastinum: A Comparative Study and Review of the Literature. Ann Thorac Surg. 2008;86(3):962-6.
2. Dajer-Fadel WL, Arguero-Sanchez R, Ibarra-Perez C, et al. Systematic review of spontaneous pneumomediastinum: a survey of 22 years' data. Asian CardiovascThorac Ann. 2014;22(8):997-1002.
3. Ojhave S, Gaskin J. Spontaneous pneumomediastinum. BMJ Case Rep. 2018;2018:bcr2017222965.
4. Ødegaard KJ, Haavardsholm E, Husby A. Spontaneous pneumomediastinum. TidsskrNorLaegeforen. 2018;26:38(11).
5. Khadija C, Nahid Z, Hanane B, et al. Spontaneous pneumomediastinum: about 18 cases. Pan Afr Med J. 2018;31:75.
6. Takada K, Matsumoto S, Hiramatsu T, et al. Spontaneous pneumomediastinum: an algorithm for diagnosis and management. Ther Adv Respir Dis. 2009;3(6):301-307.,
7. Song IH, Lee SY, Lee SJ, et al. Diagnosis and treatment of spontaneous pneumomediastinum: experience at a single institution for 10 years. Gen Thorac Cardiovasc Surg. 2017;65(5):280-284.
8. Fitzwater JW, Silva NN, Knight CG, et al. Management of spontaneous pneumomediastinum in children. J Pediatr Surg. 2015;50(6):983-6.
9. Campillo-Soto A, Coll-Salinas A, Soria-Aledo V, et al. Spontaneous pneumomediastinum: descriptive study of our experience with 36 cases. Arch Bronconeumol. 2005;41(9):528-31.
10. Pekcan S, Gokturk B, Uygun Kucukapan H, et al. Spontaneous pneumomediastinum as a complication in human bocavirus infection. Pediatr Int. 2014;56(5):793-5.

11. Demirel A, Aynacı E, Özgül MA, et al. Primer spontan pnömomediastinum. Solunum. 2008;10: 71–73.
12. Kaneki T, Kubo K, Kawashima A, et al. Spontaneous pneumomediastinum in 33 patients: yield of chest computed tomography for the diagnosis of the mild type. Respiration. 2000;67(4):408-11.
13. Zylak CM, Standen JR, Barnes GR, et al. Pneumomediastinum Revisited. Radio Graphics. 2000;20(4):1043-57.
14. Göktekin MÇ. Evaluation of patients with spontaneous pneumomediastinum diagnosis in the emergency department. Cukurova Med J 2019;44(4):1155-1159.
15. Koullias GJ, Korkolis DP, Wang XJ, et al. Current assessment and management of spontaneous pneumomediastinum: experience in 24 adult patients. Eur J Cardiothorac Surg. 2004;25:852–5.

REVIEW / DERLEME

Emergency Medicine and Artificial Intelligence

Acil Tıp Ve Yapay Zeka

Mehmet Mahir Kunt[1], Mehmet Ali Karaca[1], Bülent Erbil[1], Erhan Akpınar[1]

ABSTRACT

Artificial Intelligence has taken a significant place in our daily lives in the age of information and technology. In recent years, learning to use artificial intelligence and machine learning techniques has been developing rapidly in many fields of medicine, especially in emergency medicine. Artificial intelligence holds promise in numerous applications in emergency medicine, including interpreting diagnostic imaging, predicting patient outcome, and monitoring patient vital signs. In this review, recent studies on the use of artificial intelligence in emergency medicine were discussed.

Keywords: Artificial intelligence, machine learning, emergency medicine

ÖZ

Yapay zeka, bilgi ve teknoloji çağında günlük hayatımızda önemli ölçüde yer edinmiştir. Son yıllarda yapay zeka ve makine öğrenimi teknikleri kullanılması öğrenimi özellikle acil tıp başta olmak üzere tıbbın birçok alanında hızlıca gelişmektedir. Yapay zeka, acil tıp içindeki tanısal görüntülemenin yorumlanması, hasta sonlanımının tahmin edilmesi ve hastanın yaşamsal bulgularının izlenmesi dahil sayısız uygulamada umut vaat etmektedir. Bu derlemede yapay zekanın acil tıpta kullanımına yönelik son yıllarda yapılan çalışmalar toplanmıştır.

Anahtar Kelimeler: Yapay zeka, makina öğrenmesi, acil tıp

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Giriş:

Yapay zeka (YZ), "bir sistemin dış verileri doğru bir şekilde yorumlama, bu verilerden öğrenme ve bu öğrenmeleri esnek adaptasyon yoluyla belirli hedeflere ve görevlere ulaşmak için kullanma yeteneği" olarak tanımlanabilir (1).

Dar Yapay Zekalar ismi verilen ilk nesil YZ'lar sadece belirli işler için tasarlanmışlardır. Örneğin fotoğraftan yüz tanıma veya ses tanıyarak yazı yazma gibi tek konuda tasarlanmışlardır. Bugün için pek çok konuda kullanımdadırlar. Yapay Genel Zekâlar olarak isimlendirilen 2. Nesil YZ'lar ise bağımsız olarak daha önceden programlanmadıkları konularda bile bağımsız olarak akıl yürütebilecek, planlayabilecek ve sorunları çözebileceklerdir. Gelecekte bir gün gerçekten kendinin farkında ve bilinçli sistemler olan 3. Nesil Yapay Süper Zekalar ise insanları gereksiz hale getirebilir (1).

Yapay zeka ile ilgili ilk fikirler 1940'lı yıllara dayanır. Bilim adamlarına YZ konusunda ilham kaynağı olan Isaac Asimov tarafından yazılan Runaround isimli bilimkurgu romandır. Bu romanda robotiğin üç kuralı tanımlanmıştır. (1) Robotlar insana zarar veremez veya kendine zarar verecek insanlara karşılık veremez. (2)Robotlar, birinci kural ile çelişmeyen tüm emirlere uymak zorundadır; ve (3)Robotlar, birinci veya ikinci kuralla çelişmeyen durumlarda kendi varlıklarını korumalıdırlar (2).

Aynı yıllarda İngiliz matematikçi Alan Turing, Alman ordusu tarafından kullanılan Enigma kodunu deşifre etmek amacıyla İngiliz hükümeti için çalışan ilk elektro-mekanik bilgisayar olarak kabul edilen The Bombe adlı bir kod kırma makinesi geliştirdi. 1950'de, akıllı makinelerin nasıl oluşturulacağını ve özellikle zekalarının nasıl test edileceğini açıkladığı ı makalesi "Computing Machinery and Intelligence" ı yayınladı. Turing Testi bugün hala yapay bir sistemin zekasını belirlemek için bir kriter olarak kabul edilmektedir. İnsan başka bir insan ve bir makine ile etkileşime girdiğinde, makineyi insandan ayırt edemiyorsa, o zaman makinenin zeki olduğu kabul edilir (2).

Yapay Zeka kelimesi, yaklaşık altı yıl sonra, 1956'da Stanford'da bilgisayar bilimcileri olan Marvin Minsky ve John McCarthy New Hampshire Dartmouth College'da düzenledilkeri yaklaşık sekiz haftalık Dartmouth Yapay Zeka Yaz Araştırma Projesi ile (DSRPAI) gündeme geldi (2).

İlk YZ örneklerinden biri, 1964 ve 1966 yılları arasında MIT'de Joseph Weizenbaum tarafından yazılan ünlü ELIZA bilgisayar programıdır. ELIZA, Turing Testini geçmeyi deneyebilen insan konuşmasını taklit eden bir dil işleme programıydı (3). Başlangıçta YZ alanında ilerlemenin yavaş olması ilk programların insan zekasını "eğer -o zaman" (if-then) döngüsüyle yapılmaya çalışılmasıydı. Bazı özel uzmanlık gerektiren durumlarda bu tür yaklaşım oldukça başarılı olabilir (2). Örneğin, 1997'de IBM'in Deep Blue satranç oynama programı dünya şampiyonu Gary Kasparov'u yenmeyi başardı. Deep Blue saniyede 200 milyon olası hareketi tahmin ederek ve ağaç arama adı verilen bir yöntemi kullanarak 20 hamle ilerisindeki en uygun hamleyi belirleyebiliyordu (4).

1940'larda Kanadalı psikolog Donald Hebb'in Hebbian Learning olarak bilinen ve gerçek yapay zekaya ulaşmak için istatistiksel yöntemlerle ve insan beynindeki nöronların sürecini kopyalayan bir öğrenme teorisi geliştirdi (5). Bu, Yapay Sinir ağları üzerine araştırmalara yol açtı. Ancak bu çalışmalar 1969'da Marvin Minsky ve Seymour Papert'in bilgisayarların bu tür yapay sinir ağlarının gerektirdiği işi yapmak için yeterli işlem gücüne sahip olmadığını göstermeleriyle durakladı (2). 2015 yılında Google tarafından geliştirilen AlphaGo isimli program Go'da dünya şampiyonunu yenmeyi başardı. AlphaGo, yüksek performansını Derin Öğrenme adı verilen belirli bir yapay sinir ağı yoluyla sağladı (6). Günümüzde yapay sinir ağları ve derin öğrenme, YZ etiketi altında bildiğimiz çoğu uygulamanın temelini oluşturmaktadır. Facebook tarafından kullanılan görüntü tanıma algoritmaları, akıllı hoparlörler ve sürücüsüz arabalardaki konuşma tanıma algoritmalarının temeli YZ uygulamalarıdır (2).

Acil Serviste Yapay Zeka Uygulamaları:

Acil Serviste (AS) makine öğrenimli YZ sistemleri, hastalıkların etkin bir şekilde tedavi edilebilmesi, ilerlemesinin ve uygun olmayan komplikasyonlarının ortaya çıkmasının önlenebilmesi için tahmin etme ve erken tespit etmede faydalı olabilirler (7). Naylor, sağlık hizmetlerinde yapay zekanın ve makine öğrenmesinin benimsenmesini sağlayan 7 faktörü tanımlamıştır: (1) dijital görüntülemenin insan yorumuna etkileri; (2) sağlıkla ilgili kayıtların sayısallaştırılması ve veri paylaşımı; (3) derin öğrenmenin heterojen veri kümelerinin analizine uyarlanabilirliği; (4) araştırmalarda hipotez oluşturma için derin öğrenme kapasitesi; (5) klinik iş akışlarını düzene sokmak ve hastaları güçlendirmek için derin öğrenmenin umut vaat etmesi; (6) hızlı yayılan açık kaynaklı ve özel derin öğrenme programları; ve (7) günümüzün temel derin öğrenme teknolojisinin, veri kümeleri büyüdükçe gelişmiş performans sağlamak için yeterliliği (8).

Hastane Öncesi Acil sağlık hizmetlerinde kullanılan Corti AI isimli bir yapay zeka uygulaması arayanın konuşmasını ve açıklamasını analiz ederek ve bir sonraki sorulacak sorular hakkında tavsiyelerde bulunarak, bir hastanın miyokart enfarktüsü veya inme gibi hızlı müdahale gerektiren durumları ayırt edebilir. Ayrıca, aramayı tamamlamak ve ambulans göndermek için gereken süreyi azaltmak için arayanın adresi ve/veya konumu hakkında bilgi toplayarak yardımcı olur (9).

Acil servisteki YZ'nın en yaygın kullanım yerlerinden biri triyajdır. Acil servis içindeki hastaların triyaj işlemi hasta akışını, bekleme sürelerini, kaynak kullanımını ve tahsisini ve risk sınıflandırmasını doğrudan etkiler(10,11). Özellikle kalabalık acil servislerin olduğu durumlarda, bu adımlar hızlı bir şekilde ve genellikle sınırlı bilgi ile tamamlanmak zorundadır. Amerika'da en sık kullanılan ESI (Emergency Severity Index) triyaj sisteminde hastaların büyük bir kısmı ESI-3 olarak sınıflandırılmaktadır. Çok sayıdaki ESI 3 hastaların akutluk sıralanmasında zorluk çekilmektedir (12). Makine Öğrenmesi modelleri, mevcut triyaj yöntemlerini geliştirme konusunda gelecek vaat etmektedir. Yapay zeka triyajı ESI-3 kategorisine yığılan hastaları kritik bakım veya acil durum prosedürü gerektiren hastaları tahmin ederek daha iyi sınıflamaktadır. Göğüs ağrısı olan hastalarda akut ve gecikmiş kardiyak komplikasyonların tahmini veya hastane içi sepsis mortalitesi gibi spesifik hastalık sonuçlarını tahmin etmek için geliştirilen makine öğrenmesi modelleri gibi özel problemlere yönelen makine öğrenme sistemleri de vardır. Hastalık sonuç tahminleriyle birleşik etkili triyaj sistemi,

kaynakları hasta ihtiyaçlarıyla daha iyi eşleştirerek acil işlemlerini daha etkili hale dönüştürebilir (11,13).

Acil serviste kaynak planlama ve kalabalık yönetimi önemli sorunlardan biridir. Sun ve ark. (14), yazarlar acil serviste iş yükünün tahmini için modeller geliştirmek için otoregresif entegre hareketli ortalama ("autoregressive integrated moving average"ARIMA) olarak adlandırılan zaman serisi analiz tekniğini kullandılar. Bu çalışma personel listesinin düzenlenmesi ve kaynak planlaması için tahmin modellerinin kullanılmasına faydalı olduğunu kanıtlamıştır. Jones ve Evans (15) tarafından yapılan çalışmada, yazarlar, faktör tabanlı bir simülasyon aracı geliştirerek doktor personel konfigürasyonlarının etkisini değerlendirmek açısından acil servis aşırı kalabalıklığını ele almıştır. Böyle bir aracın fizibilitesi tek bir hastane acil servisinde değerlendirilmiştir.

YZ'nın en çok kullanıldığı yerlerden biri acil radyolojidir. Acil hekimleri yaşamı tehdit eden patolojiyi hızlı bir şekilde tanımlamak ve radyoloğun incelemesinden önce acil taramaların bulgularına göre hareket etmek zorundadırlar. Kontrastsız kafa bilgisayarlı tomografi taramalarında kanama, kitle etkisi, hidrosefali, akut bölgesel enfarktüs, travmatik beyin hasarı ve orta hat kaymasını saptamak için çeşitli algoritmalar geliştirilmiş ve test edilmiştir. Bu algoritmaların çoğu, %94-100 aralığında duyarlılık ve %99'a varan negatif prediktivite değerleriyle, acil müdahale gerektiren yaşamı tehdit eden patolojilerin hızlı ve doğru bir şekilde dışlanmasına olanak tanımaktadır. Yüksek hassasiyetli algoritmaların kullanılması, tetkiklerin tamamlanması ile radyologların rapor etme arasında geçen sürede gecikmelerin olabileceği yoğun acil servislerde veya sınırlı radyoloji desteğine sahip kırsal acil servislerde özellikle yararlı olacaktır (16–18). YZ ayrıca travma için odaklanmış abdominal sonografi (FAST) değerlendirmesinde sıvının saptanması ve ekokardiyogramda ejeksiyon fraksiyonunun otomatik olarak hesaplanması gibi ultrason araştırmalarından tanıya yardımcı olma konusunda faydalı olduğu bulunmuştur (19,20).

AS'de YZ'nın kullanım alanlarından bir diğeri dokümantasyondur. Araştırmalar, klinisyenlerin, Elektronik Tıbbi Kayıt sistemlerinin kullanılmasıyla ilişkili yazı işlerinden giderek daha fazla tükendiğini göstermektedir. Aynı zamanda, sağlık verileri analitik algoritmaları bu sistemlerden düşük kaliteli serbest metin girilen verileri analiz etmekte güçlük çekmektedir. YZ, makine öğrenmesi, konuşma tanıma ve doğal dil işleme teknolojileri kullanılarak yapılan sanal kayıt sistemleri kayıt işlemleri hasta ile konuşurken kayıt ile ilgili işlemleri hazır hale getirerek ve kayıt zamanını yaklaşık %50 oranında azalttığı görülmüştür. Ayrıca reçete hazırlamakta yardımcı olmakta ve taburculukta hastanın anlayacağı şekilde (tıbbı terimler olmadan) yazılı öneriler hazırlamaktadır. Elektronik kayıtlar daha kolay şekilde istatiksel analiz için uygun verileri sağlayabilmektedir (21).

Yapay zeka sistemleri, klinik izlem için kullanılmaktadır. Hastanın ilk geliş semptom ve bulguları ve de temel tetkiklere dayalı olarak kardiyak komplikasyon veya sepsis olasılığını tahmin edilebilmektedir. Ayrıca kalp hızı ve ritmi ve kan basıncı dinamiklerini izleyerek klinik komplikasyonları tahmin etmek için başka araçlar da geliştirilmiştir. Sepsis ve kardiyak instabiliteyi tahmin etmeye odaklı YZ sistemlerinin mevcut klinik araçlara eşit veya daha iyi performans gösterdiği gösterilmiştir (22,23). Acil servise başvurudan sonraki 30 gün içinde Majör Kardiyak Advers Olayları (Mortalite, akut miyokard enfarktüsü (AMİ), perkütan koroner girişim (PCI) ve koroner arter baypas grefti (CABG)) tahmin edebilmek için geliştirilen YZ ve makine öğrenimi sistemi hem mortaliteyi hem de advers etkileri başarılı bir şekilde tahmin etmiştir (24).

Giyilebilir cihazlar, uzaktan izleme ve dijital konsültasyonlarla bir araya getirilen derin öğrenme ve diğer makine öğrenimi teknikleri, klinikte geleneksel aralıklı veri toplama ve yorumlama modeline ihtiyacı kaldırabilir. Bu gelişmeler, hastalar ve ailelerin daha etkili ve bilinçli öz bakım yapmasını destekleyebilir (25). Yatışlı hastanın YZ ile izlemesinin benzeri olan evde izlemin, kronik obstrüktif akciğer hastalığının akut alevlenmelerini tespit etmede etkili olduğu, alevlenmelerin %75.8'ini hastanın tedaviye başvurmasından ortalama 5 gün önce tespit ettiği gösterilmiştir. Benzer şekilde, çocuklarda yapay zekâ müdahaleleri ile astım semptomlarındaki kalıpları, hasta özniteliklerini ve kişisel astım semptom izleyici veri tabanında toplanan çevresel faktörleri kullanarak semptom başlangıcından 1 hafta önce astım alevlenmelerini tahmin etmişlerdir. Bileğe takılan ivme ölçerler, nöbetleri yüksek derecede doğrulukla tespit etmişlerdir. Yaşlılardaki düşmeleri tespit etmek için özel akıllı telefon ses uygulamaları başarılı olmuştur (7). YZ'nın AS'te katkı sağladığı alanlar Tablo-1'de özetlenmiştir.

HASTANE ÖNCESİ	• AS kalabalıklığın tahminleri • Bilgisayar destekli ambulans yönlendirmeleri • Giyilebilir cihazlar yardımıyla nöbetler ve düşmeleri önceden tahmin etmek ve olay alarmı vermek
TRİYAJ	• Hastaların daha hızlı, daha ucuz ve eşit doğrulukta triyajı • 72 saatte içinde kalp durması veya sepsis olasılığını tahmin etme
TETKİKLER	• Tanı ile ilgili kan testleri • Aşağıdakiler için tanısal görüntülemeyi yorumlama: o Sık görülen kırıklar o Pnömoni o Ejeksiyon fraksiyonu
BELGELER	• Otomatik yazma sistemleri kullanma: Konuşma tanıma ve doğal dil işleme yöntemleri kullanılarak hasta ile görüşmeleri gerçek zamanlı olarak belgelemek
TABURCULUK	• Sepsis veya kardiyak arrest gibi ileride oluşabilecek komplikasyonların olasılığını tahmin etmek için hayati değerlerin izlenmesi

Tablo 1. YZ'nın Acil Serviste Katkı Yaptığı Alanlar (26)

Twitter'daki tweet'lerin analizi sayesinde YZ sistemleri yerel bir hastanenin belirli bir yarıçapındaki kullanıcıların tweetlerinde "grip" gibi anahtar kelimeler arayarak grip salgınlarını etkili bir şekilde tahmin edebilmiştir. Program daha sonra yüksek korelasyonla belirlenen anahtar kelimeleri nöbetçi hastaneler ve doktorlardan alınan resmi istatistiklerle karşılaştırmıştır. Benzer şekilde, Twitter'da intihar düşüncesini ve girişimlerini tahmin etmek için doğal dil işleme prosedürleri kullanılmış ve başarılı olmuştur(27,28).

Acil Serviste Yapay Zeka Uygulamalarında Kısıtlılıklar ve Zorluklar:

Yapay zekadaki gelişmelere rağmen acil serviste kullanımı ile ilgili çeşitli teknik, etik ve teknolojiyi kabulle ilgili sorunlar mevcuttur. YZ ile ilgili araştırmaların çoğu retrospektiftir. Teknolojinin kabulü için daha çok randomize kontrollü çalışmalara ihtiyaç vardır. Bu çalışmalar için de daha doğru bilgilere ihtiyaç vardır. Bu da elektronik data sistemleriyle olabilir. Ayrıca yapay sinir ağları ve makine öğrenimi ile prognostik algoritmalar geliştirilmektedir. Teknolojide, güvenin yalnızca algoritmanın insan geliştiricisinin değil, aynı zamanda dahili olarak uygun kodları üretmek için bilgisayarın da ellerine verildiği bir dönüm noktasıdır. Bu da yapay zeka algoritmalarının cevap ve yorumlarının hem klinisyenler hem de hastalar için anlaşılmaz hale getirerek çok sayıda etik ve potansiyel olarak mediko-yasal zorluklar sunar. Ayrıca, toplanan sağlık verileri gizli olmak zorundadır ama optimum performans için sürekli güncelleme ve gerçek zamanlı geri bildirim gerektirmektedir. Büyük ihlalleri önlemek için hastanın rıza alınması gerekmektedir. Yapay zeka sistemlerini büyük çoğunluğu bağımsız olarak çalışmak yerine doktorlara yardımcı olsa da bu algoritmaların ne zaman ve nerede devreye girdiğinin ve yanlış klinik kararlara sebep olabileceğinin farkında olmak önemlidir (29).

Sonuç:

Acil Serviste Yapay Zeka uygulamaları verilen hizmet kalitesini arttırmakta ve hizmet yükünü azaltmaktadır. İnsana bağlı hataları azaltmakta, klinisyene karar vermede yardımcı olmaktadır. Ama YZ sistemlerinin de hatalı kararlar alabilme ihtimali gözden kaçmamalıdır. Ayrıca YZ kullanımı ili ilgili medikolegal düzenlemeler de gereklidir.

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Yazarların Katkısı: MMK literatür taraması yapmış ve yazmıştır. MAK literatür taramasına yardımcı olmuş ve redaksiyon yapmıştır. BE ve EA literatür taramasına yardımcı olmuştur.
Etik Beyan: Yazarlar araştırma ve yayın etiğine uyduklarını beyan ederler.

Kaynaklar:

1. Kaplan A, Haenlein M. Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. Bus Horiz. 2019;62(1):15-25. doi:10.1016/J.BUSHOR.2018.08.004
2. Haenlein M, Kaplan A. A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. Calif Manage Rev. 2019;61(4):5-14. doi:10.1177/0008125619864925
3. Eliza (elizabot.js). Accessed September 16, 2021. https://www.masswerk.at/elizabot/
4. Campbell M, Hoane AJ, Hsu F-H. Deep Blue. Artif Intell. 2002;134:57-83.
5. Morris RGM. D.O. Hebb: The Organization of Behavior, Wiley: New York; 1949. Brain Res Bull. 1999;50(5-6):437. doi:10.1016/S0361-9230(99)00182-3
6. Silver D, Huang A, Maddison CJ, et al. Mastering the game of Go with deep neural networks and tree search. Nature. 2016;529(7587):484-489. doi:10.1038/nature16961
7. Shafaf N, Malek H. Applications of Machine Learning Approaches in Emergency Medicine; a Review Article. Arch Acad Emerg Med. 2019;7(1):1-9. Accessed September 19, 2021. /pmc/articles/PMC6732202/
8. Stead WW. Clinical Implications and Challenges of Artificial Intelligence and Deep Learning. JAMA. 2018;320(11):1107-1108. doi:10.1001/JAMA.2018.11029
9. AI for Patient Consultations. Accessed September 19, 2021. https://www.corti.ai/
10. Stewart J, Sprivulis P, Dwivedi G. Artificial intelligence and machine learning in emergency medicine. EMA - Emerg Med Australas. 2018;30(6):870-874. doi:10.1111/1742-6723.13145
11. Berlyand Y, Raja AS, Dorner SC, et al. How artificial intelligence could transform emergency department operations. Am J Emerg Med. 2018;36(8):1515-1517. doi:10.1016/j.ajem.2018.01.017
12. Center for Health Statistics N. National Hospital Ambulatory Medical Care Survey: 2014 Emergency Department Summary Tables. Accessed September 20, 2021. http://www.cdc.gov/nchs/ahcd/ahcd_survey_instruments.htm#nhamcs.
13. Levin S, Toerper M, Hamrock E, et al. Machine-Learning-Based Electronic Triage More Accurately Differentiates Patients With Respect to Clinical Outcomes Compared With the Emergency Severity Index. Ann Emerg Med. 2018;71(5):565-574.e2. doi:10.1016/j.annemergmed.2017.08.005
14. Sun Y, Heng BH, Seow YT, et al. Forecasting daily attendances at an emergency department to aid resource planning. BMC Emerg Med. 2009;9. doi:10.1186/1471-227X-9-1
15. Jones SS, Evans RS. An agent based simulation tool for scheduling emergency department physicians. AMIA Annu Symp Proc. Published online 2008:338-342.
16. Li Y-H, Zhang L, Hu Q-M, et al. Automatic subarachnoid space segmentation and hemorrhage detection in clinical head CT scans. Int J Comput Assist Radiol Surg. 2011;7(4):507-516. doi:10.1007/S11548-011-0664-3
17. Yuh EL, Gean AD, Manley GT, et al. Computer-aided assessment of head computed tomography (CT) studies in patients with suspected traumatic brain injury. In: Journal of Neurotrauma. Vol 25. ; 2008:1163-1172. doi:10.1089/neu.2008.0590
18. Xiao F, Liao CC, Huang KC, et al. Automated assessment of midline shift in head injury patients. Clin Neurol Neurosurg. 2010;112(9):785-790. doi:10.1016/J.CLINEURO.2010.06.020
19. Sjogren AR, Leo MM, Feldman J, et al. Image segmentation and machine learning for detection of abdominal free fluid in focused assessment with sonography for trauma examinations: A pilot study. J Ultrasound Med. 2016;35(11):2501-2509. doi:10.7863/ultra.15.11017
20. Knackstedt C, Bekkers SCAM, Schummers G, et al. Fully Automated Versus Standard Tracking of Left Ventricular Ejection Fraction and Longitudinal Strain the FAST-EFs Multicenter Study. J Am Coll Cardiol. 2015;66(13):1456-1466. doi:10.1016/j.jacc.2015.07.052
21. NH C. Ambient virtual scribes: Mutuo Health's AutoScribe as a case study of artificial intelligence-based technology. Healthc Manag forum. 2020;33(1):34-38. doi:10.1177/0840470419872775
22. Shashikumar SP, Stanley MD, Sadiq I, et al. Early sepsis detection in critical care patients using multiscale blood pressure and heart rate dynamics. J Electrocardiol. 2017;50(6):739-743. doi:10.1016/j.jelectrocard.2017.08.013
23. Muniz GW, Wampler DA, Manifold CA, et al. Promoting early diagnosis of hemodynamic instability during simulated hemorrhage with the use of a real-time decision-assist algorithm. J Trauma Acute Care Surg. 2013;75(2 SUPPL. 2). doi:10.1097/TA.0B013E31829B01DB
24. Zhang P-I, Hsu C-C, Kao Y, et al. Real-time AI prediction for major adverse cardiac events in emergency department patients with chest pain. Scand J Trauma, Resusc Emerg Med 2020 281. 2020;28(1):1-7. doi:10.1186/S13049-020-00786-X
25. Naylor CD. On the Prospects for a (Deep) Learning Health Care System. JAMA. 2018;320(11):1099-1100. doi:10.1001/JAMA.2018.11103
26. Grant K, McParland A, Mehta S, Ackery AD. Artificial Intelligence in Emergency Medicine: Surmountable Barriers With Revolutionary Potential. Ann Emerg Med. 2020;75(6):721-726. doi:10.1016/j.annemergmed.2019.12.024
27. Aslam AA, Tsou MH, Spitzberg BH, et al. The reliability of tweets as a supplementary method of seasonal influenza surveillance. J Med Internet Res. 2014;16(11). doi:10.2196/jmir.3532
28. Burnap P, Colombo G, Amery R, et al. Multi-class machine classification of suicide-related communication on Twitter. Online Soc Networks Media. 2017;2:32-44. doi:10.1016/J.OSNEM.2017.08.001
29. Grant K, McParland A. Applications of artificial intelligence in emergency medicine. Univ Toronto Med J. 2019;96(1):37-39.