E-ISSN
Volume: 1 Issue: 1 April 2019

EURASIAN JOURNAL of CRITICAL CARE

EPAT
1999
Emergency Physicians Association of Turkey

VM ACADEMY

Editorial

Sokakta oynarken trafik kazası sonrası kendisinden habersiz bir şekilde acil servise getirilen çocuğunun durumunu duyar duymaz hemen telaş, endişe, korku ile acil servise gelen ve "çocuğumun durumu nasıl?" sorusuna "kritik" yanıtının bir annede oluşturduğu halet-i ruhiyeyi anlamak mümkün mü?

Çok uzun bir süredir bitkisel hayat sürecindeki bir hastanın eşine "bu kadar süre nasıl sabrettiniz, tahammül ettiniz?" sorusuna verilen "gözleri ile bana bakması bile yeter" cevabını anlamak ne mümkün. Ya yoğun bakım ünitesinde bizlerin koma olarak takip ve tedavi etmeye çalıştığı hastaların bu süreçte ne yaşadıklarını anlamak...

Kritik bakım son on yıllarda ve özellikle de acil tıbbın dünyada sahne almasıyla çok hızlı gelişen bir tıp dalı. Toksikoloji, görüntüleme, invaziv-noninvaziv monitorizasyon ve girişimler, kapsamlı laboratuvar analizleri, özellikli bakım gibi birçok komponenti ile her geçen gün daha da popüler olmaya namzet görünüyor.

Kritik bakım konusunda hasta bakımındaki gelişmelere paralel olarak literatür de gittikçe zenginleşmekte, yeni yeni algoritmalar oluşmakta.

Acil tıp camiası olarak kritik bakım konusundaki deneyimlerimizi, bilimsel çalışmalarımızı tüm dünya ile paylaşmak önemli bir hedefimiz.

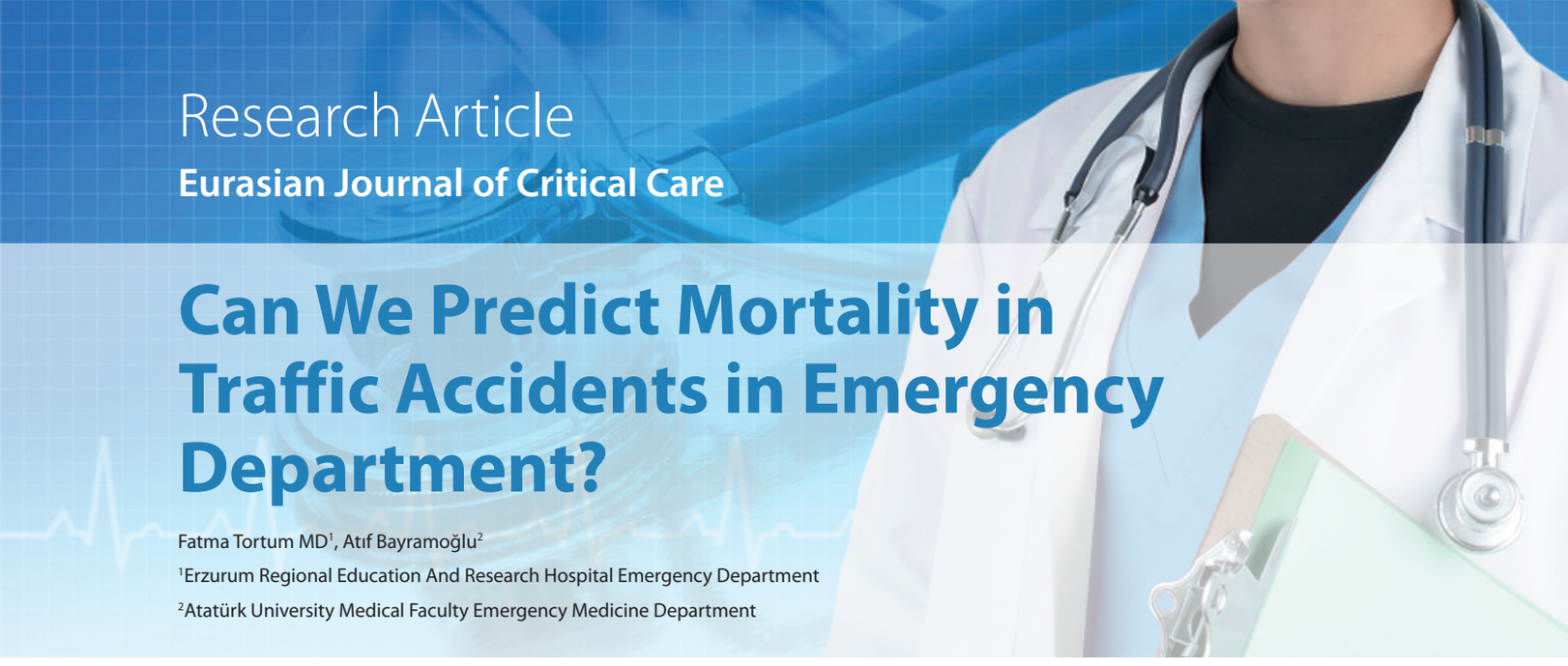
Yayın hayatına anlamlı bir zamanda (derneğimizin kuruluşunun 20. yılı) başlayan "....." dergimizin önemli bir boşluğu doldurmakla kalmayıp, uluslararası bilimsel şampiyonlar liginde en üst sıralarda yerini alacağına inancımız tamdır.

Dergimizin vücut bulmasında inanılmaz bir eforla gece gündüz demeden çaba sarf eden, acil tıp ve kritik bakım konusunda kitaplar, kongreler ve daha birçok eserlerle ülkemizin gururu haline gelen dernek başkanımız Prof. Dr. Başar Cander'e camiamız adına teşekkür ederiz. Liderin takımı içerisinde yer almanın mutluluğunu emeği geçen diğer tüm arkadaşlarımızla paylaşıyor, dergimizin kritik bakımla ilgilenen tüm tıp camiası ve insanlığa sağlık getirmesini dilerim.

Tüm editöriyal kurul adına baş editör;
Prof. Dr. Mehmet Gül

Contents

Research Article
Eurasian Journal of Critical Care



Can We Predict Mortality in Traffic Accidents in Emergency Department?

Fatma Tortum MD[1], Atıf Bayramoğlu[2]
[1]Erzurum Regional Education And Research Hospital Emergency Department
[2]Atatürk University Medical Faculty Emergency Medicine Department

Abstract

Introduction and Objective: Traffic accidents are one of the leading causes of mortality in young adults. Several physiological and biochemical parameters were defined for this purpose. Our objective was to investigate the correlation between mortality and the biochemical parameters, hemogram parameters and blood gas parameters.

Materials and Methods: 768 patients, who had applied to the emergency unit of the Atatürk University Research Hospital due to the traffic accident between 01.01.2017 and 01.07.2017, were retrospectively investigated. Two groups were formed from patients, who died (Group 1) and discharged (Group 2). The information about the patients and the biochemical parameters, hemogram parameters, blood gas analyses were retrieved from the electronic patient files and application files in the emergency department. Data were analyzed with SPSS v20 software package. The accepted limit of significance was $p<0.05$.

Results: 42.2 % of patients were hospitalized and treated in the clinics and 1.4 % died. There was a significant difference between the groups regarding pH, lactate, HCO_3, SBC, PCO_2, calcium and albumin levels. However, the differences in respect of hematocrit, platelet,WBC levels were insignificant (Table 1).

Discussion and Conclusion: An increase in the base deficit, which emerges due to the metabolic acidosis and lactic acidosis as a result of hypovolemia, was described in several studies focused on the patients injured in traffic accidents. Our study confirmed the findings in the literature and showed that the values of pH, HCO_3, SBC, SBE, calcium and albumin were lower in the patients, who died, compared to the discharged patients.

Key words: carbon monoxide, poisoning, hyperbaric oxygen, carboxyhemoglobin

Introduction and Aim

Background: Traumas are one of the leading causes of adult deaths in the world. One of the most important causes of trauma is traffic accidents. Traffic accidents account for 25% of all injuries. More than 1 million people die as a result of traffic accidents each year, and 20-50 million people are injured in these accidents[1]. Traffic accidents are one of the leading causes of morbidity worldwide. It is expected to be the fifth cause of mortality in the world in the year two thousand and thirty[2]. Most of the fatal accidents occur in developing countries where less protected vehicles are used in traffic accidents such as bicycles or motorcycles[3]. According to TurkStat (Turkish Statistical Institute) data, a total of 1 million 182 thousand 491 traffic accidents occurred in 2016 in Turkey. Of these accidents, 182 thousand 128 are with fatal injuries. In these accidents, 3 thousand 493 people died at the scene, while 3 thousand 807 people lost their lives in the health care institutions (www.tuik.gov.tr).

The mortality resulting from a traffic accident can be examined in three periods. The deaths caused by the laceration of the central nervous system or the large vessels usually occur at the scene (immediate deaths). Deaths within the first few hours of trauma are defined as early deaths. Early deaths account for 30% of all deaths. If patients with external or internal bleeding or hemopneumothorax do not receive appropriate medical assistance within the first few hours (golden hours), they result in early deaths. The source of bleeding for these patients may be subdural-epidural hematomas, injury to the parenchymal organs such as the spleen-liver or pelvic fractures. Late deaths are usually caused by multiorgan failure or sepsis[4, 5]. Early predictions of mortality in emergency services are possible in the early death group where we can change the result with the right interventions.

Corresponding Author: Fatma Tortum **e-mail:** drcitirik@hotmail.com
Received: 13.12.2018 • **Accepted:** 21.02.2019

In order for early prediction of mortality, many trauma scores and parameters have been developed. Again, for this purpose, many biochemical and physiological parameters are evaluated. Some of the most commonly used scoring methods for physiological parameters are Glasgow Coma Scale, Revised Trauma Score and Prehospital Index. The revised trauma score Glasgow coma scale, defined 30 years ago, consist of physiological parameters including systolic blood pressure and respiratory rate. It does not require advanced medical devices and examinations. It is suitable for use at the scene and at the time of the first application to the emergency service for the determination of the severity of the trauma[6]. Some scoring systems assess the anatomic localization in determining the severity of trauma. Abbreviated injury scale (AIS), injury severity score (ISS) and TRISS, developed by combining both are the most commonly used anatomic trauma scoring systems[7]. Each of these scoring systems have disadvantages and advantages, and none can precisely predict mortality.

Aim: In this study, we aimed to investigate the efficacy of biochemical, blood gas and hemogram tests that are routine examinations for most of the trauma patients in emergency services in predicting mortality.

Materials and Methods

Study design-setting: Our study was performed retrospectively in the Emergency Medicine Clinic of the Medical Faculty Research Hospital in Ataturk University. The Medical Faculty Research Hospital in Ataturk University is the largest university hospital in Eastern Anatolia. It also often accepts patients from the surrounding cities. The patients who applied to the emergency medicine clinic with the complaint of traffic accident between 01.01.2017-01.07.2017 were examined.

Participants: All patients who had a traffic accident and admitted to the emergency service of our hospital were examined. Patients with multisystem injury who were hospitalized for further examination and treatment due to mortality risk were included in the study and divided into two groups. The study group consisted of patients who resulted in exitus in our hospital due to traffic accidents. The control group consisted of patients who were discharged after inpatient treatment in any clinic or intensive care unit. Of the patients admitted to our clinic due to traffic accidents, outpatients, those with minimal trauma and those without multisystem injury were excluded from the study due to the low risk of trauma-related mortality.

Variables: Blood gas analyzes of the cases were examined. Of the blood gas parameters, Ph, HCO_3, SBE (standard base excess), SBC (standard bicarbonate), Na (sodium), K (potassium), glucose, PO_2 (partial oxygen pressure) and PCO_2 (partial carbon dioxide pressure) were evaluated. In addition, in hemogram, WBC (White blood cell), hemoglobin, hematocrit, MCH (mean corpuscular hemoglobin), MCHC (mean corpuscular hemoglobin concentration), MCV (mean corpuscular volume) and platelet values were evaluated, and in biochemistry, serum Na, serum glucose, serum K, CK (creatine kinase), CK-MB, AST (aspartate transaminase), ALT (alanine aminotransferase), GGT (gamma-glutamyl transferase), total bilirubin, direct bilirubin, Ca and albumin values were evaluated.

Data source-measurement: The hemogram, biochemistry and blood gas analyzes of the patients at the time they first applied to the emergency service were examined. Hemogram parameters are measured in whole blood with a hemogram-specific Sysmex brand hemogram device in the laboratory. Biochemical parameters were studied on a Beckman Co Ulter AU 5800 brand device. For blood gas analysis, samples were collected with special heparin injectors and ABL 800 Flex brand devices were used.

All the data of the patients were obtained from the electronic records in the hospital information management system "ENLIL" used in our hospital.

Study size: 768 patients were admitted to the emergency service of our hospital with the complaint of traffic accident between 01.01.2017-01.07.2017. 433 of these patients were minor trauma outpatients who were discharged from the emergency service of our hospital. This group was excluded from our study. The remaining 324 patients received inpatient treatment in the clinics and intensive care units at our hospital and were discharged afterwards. Eleven patients resulted in exitus in our hospital.

Statistical methods: In descriptive statistics, for categorical data, percentage frequency analysis was used, and mean (±) standard deviation and minimum maximum values were calculated for numerical data. Chi-squared test was used to compare the categorical values between the study and control groups, and student's t-test was used to compare the numerical data. P value <0.05 was considered significant.

Findings

Participants: In our study, 768 patients who were admitted to our hospital due to traffic accidents were examined. Of these patients, 433 without multisystem trauma, which we called minor trauma, were excluded from our study. Of the three hundred and thirty-five patients, 11 (3.3%) were included in our study group because they resulted in exitus. 324 (96.7%) patients who were treated and discharged were evaluated as the control group.

Of the patients examined, 116 (34.6%) were females and 219 (65.4%) were males. The mean age of the patients who applied to the emergency service due to traffic accidents was found as 34. The mean age of the group that resulted in ex-

itus in our study was 36. There was no statistically significant difference between the two groups (p=0.671). When the blood gas analysis of the patients who resulted in exitus was examined, the Ph value of this group was found to be lower than the control group. This decrease was statistically significant (p<0.001). Again, the base excess and lactate values of the group that resulted in exitus were statistically significantly higher (p=0.008, p=0.018, respectively). The bicarbonate and standard bicarbonate concentrations of the group that resulted in exitus were statistically significantly lower (p=0.004, p=0.038, respectively). The PCO_2 value was higher in the exitus group than the control group (p=0.021).

Serum Ca (calcium) and albumin levels were found to be lower in the study group (p=0.016, p=0.019, respectively). Among the hemogram parameters, hemoglobin levels were lower in the study group (p=0.045). However, there was no significant difference between hematocrit, platelet and WBC values. In the study group, MCHC was found to be lower (p=0.07) and MCV values were found to be higher (p=0.044). (Table 1).

Discussion

Key result: In our study, we concluded that lactate and blood pH values of blood gas parameters may be useful in predicting mortality.

The most common cause of in-hospital deaths that occur as a result of traffic accidents is hypovolemia caused by head trauma and bleeding[8]. Perfusion diffusion due to hemorrhagic shock developing based on bleeding and tissue hypoxia are the main causes of mortality[9]. This results in the development of metabolic acidosis. In some studies, the development of hypothermia, metabolic acidosis and coagulopathy in trauma patients has been defined as the triad of death[10, 11]. At the same time, serum lactate levels increase with tissue hypoxia resulting from perfusion diffusion. It has been shown in some studies that mortality is associated with increased lactate values[12,13]. There are even publications suggesting that lactate values can be utilized during the diagnosis and treatment of hypovolemic shock. In the study conducted by Blow in 1990, increased mortality was

Table 1. Patients' blood gas analyze, hemogram and biochemikal parameters

	Group 1 Mean ± standard deviation	Group 2 Mean ± standard deviation	P value	Total Mean ± standard deviation	Reference range
Age	**37 ± 24**	**34 ± 20**	**0.671**	**34 ± 20**	
Ph	7.20 ± 0.19	7.39 ± 0.07	0.028	7.38 ± 0.1	7.35-745
Lactate	6.1 ± 3.3	2.5 ± 1.9	**0.018**	2.7 ± 2.2	0.5-1.6
HCO_3 (mmol/L)	17.8 ± 5.6	22.2 ± 1.4	**0.004**	21.9 ± 4.3	21.2-28.3
SBC	16.9 ± 6	22.2 ± 3.3	**0.038**	22.1 ± 3.7	
SBE (mmol/L)	-8.3 ± 8.5	-2.5 ± 5.8	**0.008**	-2.8 ± 6	0-0
PCO_2 (mmHg)	44.6 ± 6.8	37.8 ± 8	**0.021**	38.2 ± 8.2	32-45
PO_2 (mmHg)	66 ± 31	65 ± 46	0.941	65 ± 45	83-108
Blood gas Na	139 ± 5	138 ± 3	0.672	138 ± 3	135-148
Blood gas K	3.9 ± 1.1	3.8 ± 3.5	0.815	3.8 ± 0.5	3.4-4.5
Blood gas glucose	214 ± 217	142 ± 58	0.414	145 ± 75	10-105
Serum Na (mmol/L)	137 ± 5	137 ± 2	0.822	137 ± 2.5	136-146
Serum Glucose (mg/dL)	225 ± 193	128 ± 52	0.147	131 ± 61	74-106
Serum K (mmol/L)	4.4 ± 2	4 ± 0.4	0.465	4 ± 0.5	3.5-5.1
CK (U/L)	1121 ± 1442	614 ± 1104	0.162	635 ± 1120	0-0
CK-MB (U/L)	763 ± 1563	50 ± 50	0.168	79 ± 329	1-24
AST (U/L)	386 ± 529	52 ± 84	0.077	62 ± 133	1-50
ALT (U/L)	236 ± 294	39 ± 70	0.064	45 ± 91	1-50
GGT (U/L)	19 ± 7	23.7 ± 23.3	0.520	24 ± 23	1-55
Total bilirubin (mg/dL)	0.4 ± 0.2	0.6 ± 0.5	0.243	0.6 ± 0.5	0.3-1.2
Direct bilirubin (mg/dL)	0.1 ± 0.03	0.1 ± 0.3	0.688	0.1 ± 0.3	0-0.2
Ca (mg/dL)	8 ± 0.9	8.8 ± 0.7	**0.016**	8.9 ± 0.7	8.8-10.8
Albumin (g/dL)	3.2 ± 0.6	3.9 ± 0.5	**0.019**	3.9 ± 0.5	3.5-5.2
WBC (10^3/µL)	16 ± 8	12 ± 5.4	0.197	12 ± 5.5	4.3-10.3
Hemoglobin (g/dL)	12.9 ± 2.9	14.4 ± 2	**0.045**	14.4 ± 2	13.6-17.2
Hematocrit (%)	39.4 ± 8	41.8 ± 6	0.216	42 ± 6	39.5-50.3
MCH (pg)	28.4 ± 2	28.8 ± 2	0.627	28.2 ± 2	27.2-33.5
MCHC (g/dL)	32.7 ± 1.1	34.4 ± 1.3	0.07	34.4 ± 1.3	32.7-35.6
MCV (fL)	87 ± 6	83.6 ± 5	**0.044**	83.7 ± 5	80.7-95.5
Platelet (10^3/µL)	229 ± 86	258 ± 76	0.240	257 ± 76	150-450

shown in patients whose lactate levels could not be reduced or normalized in the first 24 hours[12, 13]. For this reason, the first 24 hours are defined as the silver day for trauma patients. Applications to be planned for the treatment of the patient such as emergency surgery or intensive resuscitation should be planned within the first 24 hours under the guidance of lactate value[14]. Increased lactate levels together with tissue hypoxia leads to metabolic acidosis in patients. The importance of acidosis, where the blood Ph value was defined as <7.35, in the diagnosis and treatment of hemorrhagic shock was determined by studies[15]. In this case, decreased serum Ph value will also be associated with mortality[15]. The increased production of organic acids with trauma and the reduction of the removal of organic acids deepens metabolic acidosis. In this case, some buffer systems are activated and homeostasis is tried to be provided. The most important chemical buffer system is the HCO_3/CO_2 buffer system. With the activation of this system, serum HCO_3 amount is decreased in patients[16]. All these metabolic changes are associated with perfusion diffusion after volume loss. In order to recover this condition, the volume lost during the trauma resuscitation is attempted to be recovered. However, there is no strong evidence in the literature stating that fluid therapy prevents death in trauma patients[17]. In recent years, the definition of damage control resuscitation, which includes definitions such as permissive hypotension, balanced intravenous crystalloid fluid replacement and balanced delivery of blood products for trauma patients, has started to enter emergency services[14, 18].

Intra-abdominal injuries are important in traffic accident cases because of the mortal bleeding they will cause. Intra-abdominal bleeding is the third most common cause of death due to trauma. 50% of these deaths can be prevented by early diagnosis and treatment[19]. Therefore, ruling out intra-abdominal injury is important in cases of traffic accidents admitted to emergency services. For this purpose, physical examination, ultrasonography (USG), computed tomography (CT), laparotomy and laparoscopy can be used[20]. Some biochemical parameters showing liver function can be used together with imaging techniques and physical examination to guide the treatment of the patient[21]. In our study, no significant difference was found between the AST, ALT, GGT and bilirubin values of the patients who resulted in exitus after the traffic accident and the patients who were treated and discharged.

Albumin is a plasma protein that is involved in the transport of physiologically important molecules in blood such as drugs, vitamins, hormones and fatty acids. Albumin is also important in the regulation of plasma oncotic pressure. Previous studies determined that low albumin levels were associated with prolongation of hospital stay, increase in re-admission and impaired immunological functions[22]. Yukl et al. reported in their study related to trauma that mortality was increased in patients with low albumin who experienced blunt trauma[23]. Similarly, in our study, albumin levels of the study group patients were found to be lower than the control group.

Previous studies have shown a poor relationship between hypocalcemia and clinical improvement in patients treated under intensive care[24, 25]. At the same time, the blood gas Ph values of patients with hypocalcemia were found to be more alkalotic than the other patients[24]. Ionized calcium levels are found to be low as the binding of calcium to albumin will increase in the case of alkalosis. In the case of acidosis, the binding of calcium to albumin decreases and ionized calcium is found to be high. However, the cause of hypocalcemia following trauma may be due to external bleeding and fluid treatments during resuscitation of the trauma[26]. In our study, serum calcium levels were found to be low in the study group. However, contrary to the studies mentioned, the blood Ph values in the hypocalcemic group were more acidotic.

Hemoglobin and hematocrit values are expected to decrease in patients with post-traumatic bleeding. In many studies, hemogram and hematocrit values have been shown to be closely related to hemorrhagic shock, increased emergency surgery or mortality in trauma patients. Therefore, it is also a common practice to check the control hemogram and hematocrit values during the follow-up of traffic accident cases in emergency services. Madsen et al. showed that hematocrit values were not suitable for the diagnosis of hemorrhage[27]. In our study, there was no difference between the study and control groups interns of hematocrit, WBC and platelet values. However, hemoglobin and MCHC values were low and MCV values were high between the groups.

Limitation: The limitation of our study was that it was performed in a single center and the number of patients in the study group that resulted in exitus were insufficient.

References

1. Bazeli J, Aryankhesal A, Khorasani-Zavareh D. Exploring the perception of aid organizations' staff about factors affecting management of mass casualty traffic incidents in Iran: a grounded theory study. Electronic physician. 2017;9(7):4773-9.
2. Herman J, Ameratunga S, Jackson R. Burden of road traffic injuries and related risk factors in low and middle-income Pacific Island countries and territories: a systematic review of the scientific literature (TRIP 5). BMC public health. 2012;12:479.
3. Rezaei S, Arab M, Karami Matin B, Akbari Sari A. Extent, consequences and economic burden of road traffic crashes in Iran. Journal of injury & violence research. 2014;6(2):57-63.
4. Varol O EH, Oguzturk H, Korkmaz İ, Beydilli İ. Investigation of The Patients Who Admitted After Traffic Accident To The Emergency Department Cumhuriyet Üniversitesi Tıp Fakültesi Dergisi. 2006 28 (2):55 - 60.

5. Neklapilova V, Zelnicek P. [Epidemiology of severe injuries from the viewpoint of the trauma center]. Casopis lekaru ceskych. 2003;142(11):676-8.
6. Jeong JH, Park YJ, Kim DH, Kim TY, Kang C, Lee SH, et al. The new trauma score (NTS): a modification of the revised trauma score for better trauma mortality prediction. BMC surgery. 2017;17(1):77.
7. Osler T, Glance L, Buzas JS, Mukamel D, Wagner J, Dick A. A trauma mortality prediction model based on the anatomic injury scale. Annals of surgery. 2008;247(6):1041-8.
8. Ernstberger A, Joeris A, Daigl M, Kiss M, Angerpointner K, Nerlich M, et al. Decrease of morbidity in road traffic accidents in a high income country - an analysis of 24,405 accidents in a 21 year period. Injury. 2015;46 Suppl 4:S135-43.
9. Jousi M, Reitala J, Lund V, Katila A, Leppaniemi A. The role of pre-hospital blood gas analysis in trauma resuscitation. World journal of emergency surgery : WJES. 2010;5:10.
10. Weinberg DS, Narayanan AS, Moore TA, Vallier HA. Prolonged resuscitation of metabolic acidosis after trauma is associated with more complications. Journal of orthopaedic surgery and research. 2015;10:153.
11. Rotondo MF, Zonies DH. The damage control sequence and underlying logic. The Surgical clinics of North America. 1997;77(4):761-77.
12. Gonzalez-Robledo J, Martin-Gonzalez F, Moreno-Garcia M, Sanchez-Barba M, Sanchez-Hernandez F. Prognostic factors associated with mortality in patients with severe trauma: from prehospital care to the Intensive Care Unit. Medicina intensiva. 2015;39(7):412-21.
13. Blow O, Magliore L, Claridge JA, Butler K, Young JS. The golden hour and the silver day: detection and correction of occult hypoperfusion within 24 hours improves outcome from major trauma. The Journal of trauma. 1999;47(5):964-9.
14. Duchesne JC, Barbeau JM, Islam TM, Wahl G, Greiffenstein P, McSwain NE, Jr. Damage control resuscitation: from emergency department to the operating room. The American surgeon. 2011;77(2):201-6.
15. Summersgill A, Kanter M, Fraser RM, Caputo ND, Simon R. Determining the utility of metabolic acidosis for trauma patients in the emergency department. The Journal of emergency medicine. 2015;48(6):693-8.
16. Shane AI, Robert W, Arthur K, Patson M, Moses G. Acid-base disorders as predictors of early outcomes in major trauma in a resource limited setting: An observational prospective study. The Pan African medical journal. 2014;17:2.
17. Dabrowski GP, Steinberg SM, Ferrara JJ, Flint LM. A critical assessment of endpoints of shock resuscitation. The Surgical clinics of North America. 2000;80(3):825-44.
18. Chang R, Holcomb JB. Optimal Fluid Therapy for Traumatic Hemorrhagic Shock. Critical care clinics. 2017;33(1):15-36.
19. Shojaee M, Faridaalaee G, Yousefifard M, Yaseri M, Arhami Dolatabadi A, Sabzghabaei A, et al. New scoring system for intra-abdominal injury diagnosis after blunt trauma. Chinese journal of traumatology = Zhonghua chuang shang za zhi. 2014;17(1):19-24.
20. Kendall JL, Kestler AM, Whitaker KT, Adkisson MM, Haukoos JS. Blunt abdominal trauma patients are at very low risk for intra-abdominal injury after emergency department observation. The western journal of emergency medicine. 2011;12(4):496-504.
21. Gunes Tatar I, Yilmaz KB, Ergun O, Balas S, Akinci M, Deryol R, et al. [The effect of clinical, laboratory and radiologic results on treatment decision and surgical results in patients admitted to the emergency department with blunt abdominal trauma due to traffic accident]. Ulusal travma ve acil cerrahi dergisi = Turkish journal of trauma & emergency surgery : TJTES. 2015;21(4):256-60.
22. Herrmann FR, Safran C, Levkoff SE, Minaker KL. Serum albumin level on admission as a predictor of death, length of stay, and readmission. Archives of internal medicine. 1992;152(1):125-30.
23. Yukl RL, Bar-Or D, Harris L, Shapiro H, Winkler JV. Low albumin level in the emergency department: a potential independent predictor of delayed mortality in blunt trauma. The Journal of emergency medicine. 2003;25(1):1-6.
24. Chernow B, Zaloga G, McFadden E, Clapper M, Kotler M, Barton M, et al. Hypocalcemia in critically ill patients. Critical care medicine. 1982;10(12):848-51.
25. Zaloga GP, Chernow B, Cook D, Snyder R, Clapper M, O'Brian JT. Assessment of calcium homeostasis in the critically ill surgical patient. The diagnostic pitfalls of the McLean-Hastings nomogram. Annals of surgery. 1985;202(5):587-94.
26. Ward RT, Colton DM, Meade PC, Henry JC, Contreras LM, Wilson OM, et al. Serum levels of calcium and albumin in survivors versus nonsurvivors after critical injury. Journal of critical care. 2004;19(1):54-64.
27. Madsen T, Dawson M, Bledsoe J, Bossart P. Serial hematocrit testing does not identify major injuries in trauma patients in an observation unit. The American journal of emergency medicine. 2010;28(4):472-6.

Research Article
Eurasian Journal of Critical Care

Diagnostic Difficulties of Spontaneous Gastric Peforation in Adolescents

Zeliha Akış Yıldız[1], Ceyhan Şahin[1], Mehmet Arpacık[1], Hayriye Nihan Ayyıldız[1], Aytekin Kaymakçı[1]
[1]Umraniye Maternity and Children Training and Research Hospital Pediatric Surgery Clinic

Abstract

Objective: Spontaneous gastric perforation (SGP) in adolescents is very rare. This study aims to evaluate the diagnostic difficulties and misdiagnoses associated with SGP.

Methods: The medical records of patients that underwent surgery for a gastric perforation over the past 2 years at our paediatric surgery clinic were evaluated retrospectively. Patient demographics, symptoms, diagnostic evaluation, diagnostic difficulties, operative findings, and post operative clinical course were evaluated.

Results: Seven patients were identified as having SGP. All of the patients were adolescents. Only 1 patient had a history of gastritis; the other 6 patients did not have a history of any disease, surgery or trauma. Radiological evidence of pneumoperitoneum using upright radiography was only found in 1 patient (16.6%). One patient was misdiagnosed and thought to have appendicitis. In 2 patients, the diagnosis was unclear, so diagnostic laparoscopy was performed. Conclusion: SGP can be seen in adolescents. However, sometimes it is difficult to diagnose. Even if all the imaging studies and laboratory tests are normal, if there is a sign of peritonitis upon physical examination, diagnostic laparoscopy could be performed.

Keywords: gastric perforation, spontaneous gastric perforation

Introduction

Gastric perforation is an acute abdominal surgical condition that can present at any age[1]. The etiology of gastric perforations includes peptic ulcer disease (PUD), spontaneous, iatrogenic dermatomyositis, ingestion of caustic materials, trauma and surgery[1-5]. Neonatal gastric perforation is generally thought to be spontaneous in children experiencing trauma[5,6]. In older children or in adolescents some studies have reported on gastric perforation due to causes such as trauma and PUD[4,7-13]. However, most of the articles on spontaneous gastric perforation in children have been reported in the Japanese and Chinese literature; there are only isolated European cases[14-16]. To the best of our knowledge, there is only one published article about spontaneous gastric SGP in adolescents[2].

The diagnosis of SGP is suspected based on the physical examination findings, and it is confirmed by the presence of free air on an upright abdominal X-ray and indirect signs of perforation, such as ascites on ultrasonography (USG) and computed tomography (CT)[1,4,17,18]. Rapid diagnosis and treatment of gastric perforation is essential in order to reduce the high mortality rate of secondary peritonitis[1,17]. The present study aimed to evaluate the diagnostic difficulties of SGP and to determine a better way to diagnose it.

Materials and Methods

This paper presents our experience of 7 pediatric patients who underwent surgery at our institution between January 2016 and October 2017 due to gastric perforation. There were 6 male patients and 1 female patient ranging in age from 15 to 17. The clinical, imaging and surgical findings were reviewed for all 7 patients. A diagnostic evaluation was made.

Corresponding Author: Zeliha Akış Yıldız **e-mail:** zelihaakis@gmail.com
Received: 25.12.2018 • **Accepted:** 30.12.2018

Results

Only 1 patient had a history of gastritis, for which he was taking medication. None of the 7 patients had a history of smoking or alcohol use. None of the 7 patients had a history of trauma and surgery. All 7 of the patients had complaints of sudden and worsening abdominal pain, lasting from 2 to 48 hours. Three of the patients had emesis.

Upon examination, all 7 of the patients appeared unwell. Only patient 7 had right lower quadrant tenderness and guarding. Patient 2 and patient 4 had a rigid abdomen. The other 5 patients had tenderness and involuntary guarding at all quadrants. None of the patients had abdominal distension.

The results of the laboratory studies were not significant. The white blood cell (WBC) count ranged from normal (<12.000/UL) to elevated (Table 1). The C-reactive protein (CRP) was<1 in 5 of the 7 patients; it was not counted in the other 2 patients. Subdiaphragmatic free air was detected by upright radiography in only 1 patient. On USG, there was no sign of perforation. In 2patients, free air was not detected on CT. When it was detected on the other 5 patients, the cause of the perforation was unclear.

Patient 7, who had no free air based on the X-ray results, was thought to have appendicitis. Laparotomy was performed with a right lower transverse incision. The appendix was normal, and pathology-like fluid and food were not observed in the right lower quadrant. Since the findings for this patient were not compatible with the abdominal examination, other quadrants were checked. Fibrin was observed in the upper quadrants. The first incision was closed and an upper midline incision was made in order to repair the gastric perforation. Patients with free air, as noted on the CT scans, underwent laparotomy for gastric perforation. The diagnosis was unclear for patient 1 and patient 4, so a diagnostic laparoscopy was performed. All of the gastric perforations were in the anterior distal stomach, which were repaired using an omental patch. All of the patients were discharged home on omeprazole 40 mg daily.

The stool specimen Helicobacter pylori (H. pylori) enzyme linked immunosorbent assay and antibody panel were negative for all 7patients. We recommended endoscopy to all 7 patients but only 3 underwent an upper endoscopy 3 months later. The histopathology results of the endoscopic biopsies confirmed the diagnosis of gastritis. None of the patients had pathological evidence of an H. pylori infection.

Observation and Discussion

Paediatric gastric perforation is a rare condition[2,4,8]. In the literature, most pediatric gastric perforations are seen in adolescents[2,4,9,10]. All of our patients presented with abdominal pain. This is the most common presenting symptom [4,8,9,10,19]. In our study, 6 patients had no prior history of any disease or chronic abdominal pain. Hua et al. reported that 29 (55.7%) of the 52 patients in their study had a history of chronic abdominal pain and 11 patients had a history of PUD. In other studies, children usually presented without prior suspicion of PUD or a history of chronic pain[4,9,10]. In our study, none of patients had any evidence of H. pylori infection. The rate of H. pylori infection in perforated peptic ulcer (PPU) in adults ranges from 47% to 81%, as reported in different series[20-24]. However, there is no current data on the H. pylori infection rate in pediatric PPU. Hua et al. reported that only 4 (7.7%) patients in their study had evidence of H. pylori infection; Wong et al. reported that 2 (15.4%) out of 13 patients in their study had H. pylori infection and Baltrünaite et al. reported that 4 of the 15 patients in their study tested for H. pylori infection, and 2 patients were positive[4,9,10]. In the literature, only a few studies have investigated gastric perforation in adolescents without any pathology. However, all of these studies reported that PUD is the etiology of gastric perforation without providing enough evidence of PUD[4,8-10]. In the literature, only one previous study investigated SGP in adolescents[2], but there was no evidence of any disease or history of PUD in the patients in that study. Similarly, in our study, we did not find any evidence or history of PUD. We thought that, in the other studies, PPU could have been wrongly diagnosed or some of the patients might have had SGP.

Similar to our findings, other studies reported that, upon physical examination, patients can have right quadrant ten-

Table 1. Laboratory and Imaging studies

Patients	WBC	CRP	Freeair on X-ray	USG	CT
1	Normal	<1	No	15mm freefluid in the pelvis noother patology	No free air
2	Normal	<1	No	Normal	Minimally free fluid in the pelvis
3	Normal	<1	Yes	-	Free air
4	Normal	<1	No	12mm apandisitis	Free air
5	Normal	-	No	-	No free air, inflamation on right lower quadrant and free fluid in the pelvis, apandisit suspision
6	↑	-	No	-	Free air
7	↑	<1	No	Normal	Free air

derness or diffuse tenderness and guarding, similar to acute or perforated appendicitis[9,10,25-27]. In our study, free air was only identified by upright radiography in 1patient. The reported specificity of plain X-ray for pneumoperitoneum ranges from 53% to 89.2%[28, 29].Wong et al. conducted a study on PPU and reported that the radiography results for 8 (60%) of the 13 patients did not show free air [10]. Hua et al. reported that the radiography results for 9 (17.3%) of the 52 patients in their study did not show free air, and Baltrünaite et al. reported that the radiography results for 12 (20%) of the patients in their study did not show free air[4,9]. These findings demonstrate that 10% to 50% of patients can be misdiagnosed.

Studies in adults show that USG could be a better method for detecting free air than abdominal radiography[28-30]. However, in our cases, USG did not show free air and it resulted in misdiagnosis. Abdominal CT is widely available and is very specific and sensitive for pneumoperitoneum. The overall sensitivity and specificity of CT for gastrointestinal perforation is generally in the 80–100% range, depending on the study[31-34]. One retrospective study showed a recent increase in the use of CT and laparoscopic repair for peptic ulcers in adult patients[35].

In our study there were not free air on X-ray in 6 patients. In two of these 6 patients we did not get any benefit from CT too so we diagnosed gastric perforation with diagnostic laparoscopy in two patients. Diagnostic laparoscopy benefits patients by avoiding unnecessary surgery, avoiding unnecessary delay in diagnosis[36]. Laparoscopic approach also serves the advantage of pathology identification in patients with uncertain diagnosis, thus avoiding a misplased abdominal incision[37].

Conclusion

Gatric perforation is a rare cause of acute abdomen. Gatric perforation should be considered in patients with sudden abdominal pain and peritonitis sign on exam. We should be aware that SGP could be in adolascents if patients do not have any PUD history or an other disease history. Imaging studies can help us in confirmation of the diagnosis but sometimes free air can not be detected as though. Although all imaging studies are normal, if there is a peritonitis sign on exam diagnostic laparoscopy could be performed.

References

1. Seifarth FG, Soldes OS. Congenital anomalies and surgical disorders of the stomach. In: Wyllie R, Hyams J, Kay M. editors. Pediatric Gastrointestinal and Liver Disease. 5th ed. Philadelphia: Elsevier Saunders; 2016. 25:284–293.
2. Akalonu A, Yasrebi M, MolleRios Z. Spontaneous gastric perforation in two adolescents. Am J Case Rep. 2016;17:694–698.
3. Curt S. Koontz, Mark L. Wulkan. Lesions of the stomach. In: Holcomb, GW, Murphy JP, Ostlie DJ. editors. Ashcraft's Pediatric Surgery. 6th ed. Philadelphia: Elsevier Saunders; 2014. 29:403–413.
4. Hua MC, Kong MS, Lai MW, Luo CC. Perforated peptic ulcer in children: a 20-year experience. J Pediatr Gastroenterol Nutr.2007; 45:71–74.
5. Restrepo R, Marin DV. Acquired disorders. In: Coley BD, Bates DG, Faerber EN, Hernanz Schulman M, Kan H, Lee EY, Panigrahy A, Rigsby C. editors. Caffey's Pediatric Diagnostic Imaging. 12th ed. Philadelphia: Elsevier Saunders; 2013. 102:1048–1056.
6. Libeer F, Vanhamel N, Huyghe M, Verlinden E. Spontaneous gastric rupture in non-neonatal children: a case report. Acta Chir Belg. 2007;107(5):560–563
7. Rygl M, Pýcha K. Perforation of the stomach by a foreign body in a girl with anorexia nervosa: case report. Rozhl Chir. 2002; 81(12):628–630.
8. Morrison S., Ngo P., Chiu B. Perforated peptic ulcer in the pediatric population: a case report and literature review. J Pediatr Surg Case Rep. 2013;416–419.
9. Baltrünaite J, Trainavicius K. Perforated peptic ulcer in children: diagnosis and treatment. Lithuanian Surgery 2015;14(1):38–45.
10. Carol WY, Wong PHY, Chung PKH, Tam K, Wong KY. Laparoscopic versus open operation for perforated peptic ulcer in pediatric patients: a10-year experience. J Pediatr Surg. 2015; 50:2038–2040.
11. Koç O, Yildiz FD, Narci A, Sen TA. An unusual cause of gastric perforation in childhood: trichobezoar (Rapunzel syndrome). A case report. Eur. J. Pediatr. 2009; 168(4):495–497.
12. Nunn A, Jahn N, Hewes J, Wong C. Gastric perforation in a 16-year-old girl. BMJ. 2017; 357:1859.
13. Koplewitz BZ, Daneman A, FracrS, Ein SH, McGuigan MA, Mian M. Gastric perforation attributable to liquid nitrogen ingestion. Pediatrics 2000; 105(1):121–123.
14. Grosfeld JL, Molinari F, Chaet M, Engum SA, West KW, Rescorla FJ, Scherer LR 3rd. Gastrointestinal perforation and peritonitis in infants and children: experience with 179 cases over ten years. Surgery 1996; 120:650–655.
15. Shorter NA, Liu JY, Mooney DP, Harmon BJ. Indomethacin-associated bowel perforations: a study of possible risk factors. J Pediatr Surg 1999; 34:442–444.
16. Miserez M, Barten S, Geboes K, Naulaers G, Devlieger H, Penninckx F. Surgical therapy and histological abnormalities in functional isolated small bowel obstruction and idiopathic gastrointestinal perforation in the very low birth weight infant. World J Surg. 2003; 27:350–355.
17. Langell JT, Mulvihill SJ. Gastrointestinal perforation and the acute abdomen. Med Clin N Am. 2008; 92:599–625.
18. Awolaran OT. Radiographicsigns of gastrointestinal perforation in children: a pictorial review. Afr J Paediatr Surg. 2015; 12(3):161–166.

19. Chey WD, Wong BC. Practice parameters committee of the American College of Gastroenterology. American College of Gastroenterology guideline on the management of Helicobacter pylori infection. Am J Gastroenterol. 2007; 102(8):1808–25.
20. Metzger J, Styger S, Sieber C, Flüec M, Vogelbachd P, Hardera F. Prevalence of Helicobacter pylori infection in peptic ulcer perforations. Swiss Med Wkly. 2001; 131(7-8):99–103.
21. Seelig MH, Seelig SK, Behr C, Schönleben K. Comparison between open and laparoscopic technique in the management of perforated gastroduodenal ulcers. J Clin Gastro enterol. 2003; 37(3):226–9.
22. Ng EK, Lam YH, Sung JJ, Yung MY, To KF, Chan AC, et al. Eradication of Helicobacter pylori prevents recurrence of ulcer after simple closure of duodenal ulcer perforation: randomized controlled trial. Ann Surg. 2000; 231(2):153–8.
23. Sharma AK, Mittal S, Malvi SK. Association of Helicobacter pylori with peptic perforation in Chhattisgarh region of India. Trop Gastroenterol. 2000; 21(1):42–3.
24. Chu KM, Kwok KF, Law SY, Tuen HH, Tung PH, Branicki FJ, Wong J. Helicobacter pylori status and endoscopy follow-up of patient shaving a history of perforated duodenal ulcer. Gastrointest Endosc. 1999; 50(1):58–62.
25. Amin P, Cheng D. Management of complicated appendicitis in the pediatric population: when Surgery doesn't cut it. Semin Intervent Radiol. 2012; 29(3):231–236.
26. Kuhls TL. Appendicitis and pelvic abscess. Feigin and Cherry's Textbook of Pediatric Infectious Diseases. 7th ed. Philadelphia: Elsevier Saunders; 2014. 679–689.
27. Blundell S., Campbell A., Patel R., Besarovic S. Valentino's Syndrome in an adolescent boy with pepticulcer perforation simulating acute appendicitis. J Pediatr Surg Spec. 2015; 9(4):40–42.
28. Chen SC, Yen ZS, Wang HP, Lin FY, Hsu CY, Chen WJ. Ultrasonography is superior to plain radiography in the diagnosis of pneumoperitoneum. Br J Surg. 2002; 89:351–4.
29. Braccini G, Lamacchia M, Boraschi P, Bertellotti L, Marrucci A, Goletti O, et al. Ultrasound versus plain film in the detection of pneumoperitoneum. Abdom Imaging. 1996; 21:404–412.
30. Chen KC. Role of point of care ultrasound in the diagnosis of perforated peptic ulcer. Ultrasound in Medicine&Biology 2017; 43:111–112.
31. Cadenas RL, Martí de Gracia M, Saturio Galán N, Pérez Dueñas V, Salvatierra Arrieta L, Garzón Moll G. Use of multi detector computed tomography for locating the site of gastrointestinal tract perforations. Cir Esp.2013; 91:316–323.
32. Oguro S, Funabiki T, Hosoda K, Inoue Y, Yamane T, Sato M, et al. 64-Slice multi detector computed tomography evaluation of gastrointestinal tract perforation site: detectability of direct findings in upper and lower GI tract. Eur Radiol. 2010; 20:1396–403.
33. Chen CH, Huang HS, Yang CC, Yeh YH. The features of perforated peptic ulcers in conventional computed tomography. Hepatogastroenterology 2001;48:1393–6.
34. Solis CV, Chang Y, De Moya MA, GC Velmahos, Fagenholz PJ. Freeair on plain film: do we need a computed tomography too? J Emerg Trauma Shock.2014; 7(1):3–8.
35. Thorsen K, Glomsaker TB, vonMeer A, Søreide K, Søreide JA. Trends in diagnosis and surgical management of patients with perforated peptic ulcer. J Gastrointest Surg. 2011; 15:1329–35.
36. Yu SY, Chiu JH, Loong CC, Wu CW, Lui WY. Diagnostic laparoscopy: indication and benefit. Zhonghua Yi Xue Za Zhi (Taipei).1997; 59(3):158–63.
37. Yildiz T, Tilla Ilce H, Ceran C, Ilce Z. Simple patch closure for perforated pepticulcer in children followed by Helicobacter pylori eradication. Pak J Med Sci 2014; 30(3):493–496.

Research Article
Eurasian Journal of Critical Care

Evaluation of Suicide Attempts in Bitlis Province: A Multicenter, Retrospective, Observational Study for 6 years period

Eylem Kuday Kaykısız[1], Ramazan Güven[2], Burak Katipoğlu[3]

[1]Department of Emergency Medicine, Bitlis State Hospital, Bitlis, TURKEY

[2]Department of Emergency Medicine, Kanuni Sultan Suleyman Education and Research Hospital University of Health Science, İstanbul, Turkey

[3]Department of Emergency Medicine, Ufuk University, Dr. Rıdvan Ege Training and Research Hospital, Ankara/Turkey

Abstract

Background: Suicidal behavior, which is defined as ending the life of the individual voluntarily, is both a personal and social problem with its economic, cultural, social and legal aspects. The increase in suicide attempts in our country is remarkable as in all over the world. The aim of this study was to determine the risk factors by examining the time of suicide attempt and sociodemographic characteristics of the patients who admitted to the emergency departments (ED) suffered from the suicide attempt.

Material-methods: This retrospective, observational study included data from patients who were admitted to the ED for 6-year period between 2013-2018 years. In the study, data of the ED suicide attempt form of 7 public hospitals in the province were scanned and age, gender, marital status, educational status and month and year of suicide attempt were recorded. Data were recorded in SPSS 22.0 (Armonk, NY: IBM Corp.) programme. Categorical measurements were recorded as number and percentage, and continuous measurements were recorded as mean and standard deviation. $p < 0.05$ was accepted as statistically significant.

Results: A total of 230 patients were included in the study. 32% (n = 76) of the patients were admitted to center state hospital; 68% (n = 154) of the patients admitted to district state hospitals. 69.5% (n = 160) of the patients were between 16-24 years of age. 79.1% (n = 182) of the patients were female and 65.2% (n = 150) were single. 42.2% (n = 97) were primary school graduates and 10.0% (n = 23) were illiterate. The most common presentation was in 2015 with 23.9% (n = 55). Most of the patients included in the study were admitted to hospital in June with 15% (n = 33).

Conclusion: It is not always possible to pay attention to the psychosocial aspect of cases with suicide attempts in crowded ED. However, it is important to be aware of the risk factors to decrease the number of suicide attempts, that is among the most common causes of death in our country especially in the young age group, and consult with a psychiatrist.

Key Words: Suicide attempt; Emergency department; Demographics.

Introduction

Suicidal behavior, which is defined as ending the life of the individual voluntarily, is both a personal and social problem with its economic, cultural, social and legal aspects[1]. Suicide is considered a symptom rather than an illness in recent studies[2]. Risk factors for suicide attempt include sociodemographic factors such as past suicide attempt, severe mental disorder, young age, female gender, low education level and unemployment[3]. The incidence of annual suicide attempts in adults varies between 0.3% and 2.6%. Lifetime prevalence is reported as 0.7-10%[4]. According to data from Turkish Statistical Institute (TURKSTAT) for 2011, the rate of suicide attempt at least 1 time throughout the life is 4.6%. However, since all suicides are not reported, the actual number is estimated to be higher[5]. The increase in suicide attempts in our country is remarkable as in all over the world[6].

The aim of this study was to determine the risk factors by examining the time of suicide attempt and sociodemographic characteristics of the patients who admitted to the emergency departments (ED) suffered from the suicide attempt and in this wise, to contribute to practice about prevention of suicidal attempts which is a social problem, in Bitlis that is among provinces in the eastern region of Turkey.

Material-Methods

In this retrospective, observational study, data of patients admitted to ED of the state hospitals in Bitlis province with a suicidal attempt during a 6-year period between 2013-2018 were included after the ethics committee decision of Bitlis Eren University with a number of 2018/10-III and date of 13.12.2018. All of the hospitals included in this study, which was carried out in a province with a total population

Corresponding Author: Eylem KUDAY KAYKISIZ **e-mail:** eylemkuday@hotmail.com
Received: 27.12.2018 • **Accepted:** 21.02.2019

of 350.000, are state hospitals and the total number of daily ED is 2150 in whole city. Data of the ED suicide attempt form of 7 state hospitals in the province were scanned and age, gender, marital status, educational status of the patients and month and year of suicide attempt were recorded. Patients under the age of 16 and patients who were not enrolled in the hospital data system were excluded from the study.

Statistical Analysis

Data obtained from the study were recorded in SPSS 22.0 (Armonk, NY: IBM Corp.) program. Categorical measurements were recorded as number and percentage, and continuous measurements were recorded as mean and standard deviation. The level of statistical significance was accepted as $p < 0.05$.

Results

The number of patients who admitted to the ED of total 7 hospitals, including one center and 6 district state hospitals between 2013-2018, was 473. 141 of these whose data were incomplete of were not attained and 102 of these who are under age of 16 were exluded from the study. Total of 230 patients included in the study. 76 (%33,04) of the patients were admitted to center state hospital and the rest 154 (%66,96) patients were admitted to district state hospitals.

%79,1 (n=182) of the patients were female and %20,9 (n=48) were male. Female/male ratio was calculated as 3,8. %65,2 (n=150) of patients were single and %34,8 (n=80) of the patients were married. In evaluation of the distribution according to age groups, it is seen that 160 (%69,5) patients were in 16-24 of ages; 47(%20,6) patients were in 25-34 age group; 16 (%6,9) patients were in 35-49 age group; 6 (%2,6) patients were in 50-64 age group and 1 (%0,4) patient was older than 65 years (Table 1).

Table 1. Demographics of patients

		number of patients (n)	percent (%)
Age (years)	16-24	160	69.5
	25-34	47	20,6
	35-49	16	6,9
	50-64	6	2,6
	>65 ages	1	0,4
Sex	female	182	79,1
	male	48	20,9
Marital status	married	80	34,8
	single	150	65,2
TOTAL		230	100

In terms of educational status, 97 (%42,2) patients were primary school graduates; 23 (%10) patients were illiterate; 20 (%8,7) patients were literate; 64 (%27,8) patients were high school graduates and 26 (%11,3) patients were university graduates (Figure 1).

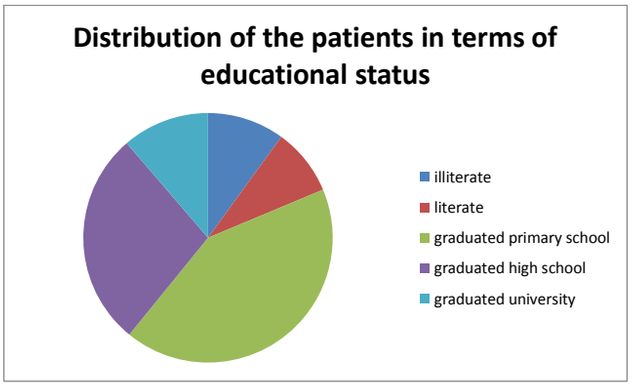


Figure 1. Distribution of the patients in terms of educational status.

In the evaluation of distribution of suicide attempts over the years; the most suicidal attempts occured in year 2015 with 55 (%23,9) patients. It is followed by 48 (%20,9) patients in 2017; 40 (%17,4) patients in 2014; 34 (%14) patients in 2018; 28 (%12,1) patients in 2016 and 25 (%10,8) patients in 2013. When the evaluating the distribution of suicidal attempts in terms of seasons, the most suicidal attempts occured in months of summer with 84 (%37) patients and it is followed by spring (n=70), winter (n=40) and autumn (n=35), respectively. The distribution of suicidal attempts in terms of years and seasons are seen in figure 2 (Figure 2).

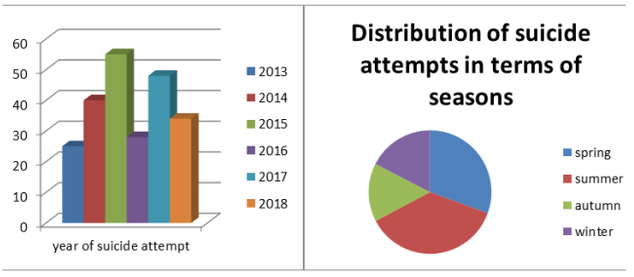


Figure 2. The distribution of suicide attempts in terms of years and seasons.

When evaluating the distribution of suicidal attempts in terms of months, it is concluded that most of the suicidal attempts were seen in June with a number of 33 (%15) patients. The frequency of suicidal attempts is seen in figure 3 (Figure 3).

Discussion

In our study that is evaluated suicidal attempts retrospectively and was performed in Bitlis, is an eastern provinces of

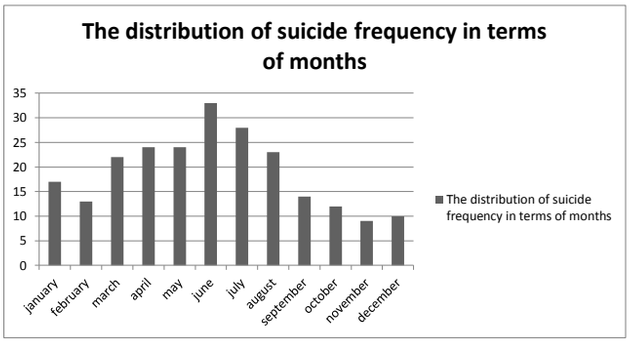


Figure 3. The distribution of suicide frequency in terms of months.

Turkey, it is concluded that suicidal attempts were mostly seen in people who is female, married, between 16-24 of ages, primary school graduates and in summer. In most study performed on this issue in literatüre, it is pointed out that suicidal attempts are more frequently seen in female that male sex[5, 7-10]. Karacaoglu et al reported as the ratio of male sex attempted suicide was 26,9% and female/male ratio was 2,71[11]. Similarly, Cayköylü et al took attention to female dominance in suicidal attempt[8]. Besides suicidal attempt rates are higher in female, another point that needs to be mentioned is that suicidal attempt rates that cause death are higher in male. According to data from TURKSTAT for 2014, %74,3 of 3065 patients with suicidal attempts that caused death, were male[12]. In our study, in accordance with the literature, female/male ratio was 3,8. Since suicidal attempts only admitted to ED were included, in other words suicidal attempts caused death did not admitted to ED, this data may not be reflect the real. This situaiton is among our study limitations. Again, it is pointed out that being single increased the suicidal attempt rate in studies performed in the past. Schmidtke et al reported that being single increased the risk of suicidal attempt and even that this risk increased in single men more than single women[13]. Similarly Keten et al and Karacaoglu et al reported that the suicidal attempts occurs more frequently in female than male in their studies[10, 11]. In accordance with the literature, in our study %65,2 of the patients was single. It is thought that taking a decision with taking into account the responsibility of the family members rather than the personal after the marriage increases the resistance and decreases the frequency of suicide attempts. Nevertheless, this theory is valid for individuals without psychiatric diseases such as schizophrenia of bipolar affective disorders.

It is reported that suicidal attempts have mostly seen in under age of 30 in many studies[11, 12, 14, 15]. Sengül et al reported that %50 of patients with suicidal attempts were under age of 25 in their study[15]. Similarly Karacaoglu et al reported %51 of patients in their study and Keten et al reported that %55,7 of patients in their study were under age of 25[10, 11]. In accordance with the literature, ın our study it has been found that %69,5 of patients attempted suicide were under age of 25.

When evaluating the suicidal attempts in terms of educational status, suicidal attempts mostly seen in primary school graduates. According to data from TURKSTAT in 2015, while 21.3% of suicidal attempts were primary school graduates in 2013, this rate was calculated as 24.9% in 2014[12]. The least suicidal attempts was reported in the illiterate group, which is consistent with the data of our study.

When the examining the frequency of suicidal attempts in term of months, the mostly suicidal attempts occured in June and summer in our study. There are conflicting data in the literatüre on this issue. Besides the conclusions support that there are more frequent suicide attempts in months of winter and autumn, Şenol et al reported that the most frequent suicide attempt occurred in July[16]. In a study conducted in Sivas province, the most frequent suicide attempt was reported in November and the least in September[17].

Conclusion

In our study that is evaluated suicidal attempts retrospectively and was performed in Bitlis, is an eastern provinces of Turkey, it is concluded that suicidal attempts were mostly seen in people who is female, married, between 16-24 of ages, primary school graduates and in summer. It is not always possible to pay attention to the psychosocial aspect of cases with suicide attempts in crowded ED. However, it is important to be aware of the risk factors to decrease the number of suicide attempts, that is among the most common causes of death in our country especially in the young age group, and consult with a psychiatrist for each patient considering that the previous suicide attempt increases the risk.

References

1. Sayar K, Bozkır F. .İntihar girişiminde bulunan ergenlerde intihar niyeti ve ölümcüllüğün belirleyicileri. Yeni Symposium 2004; 42:28-36.
2. Özsoy SD, Eşel E, İntihar (Özkıyım). Anadolu Psikiyatri dergisi 2003; 4: 175-185. .
3. Szadoczky E, Vitrai J, Rihmer Z, Furedi J. Suicide attempts in the Hungarian adult population. Their relation DIS/DSM-III-R affective and anxiety disorders. Eur Psychiatry 2000; 15: 343-7.
4. Renberg ES. Self-reported life -weariness, death - wishes, suicidal ideation, suicidal plans and suicide attempts in general population surveys in the north of Sweden 1986 and 1996. Soc Psychiatry Psychiatr Epidemiol 2001;36:429-36.
5. İntihar İstatistikleri 2011. Türkiye İstatistik Kurumu. Erişim Tarihi:10.07.2012. Erişim Adresi: http://www.turkstat.gov.tr/IcerikGetir.do?istab_id=23.
6. Devrimci-Ozguven H, Sayıl I. Suicide attempts in Turkey: results of the WHO-EURO Multicentre Study on Suicidal behaviour. Can J Psychiatry 2003;48:324-9.

7. Roy A. Psychiatric Emergencies. In: Sadock BJ, Sadock VA, eds. Comprehensive Textbook of Psychiatry. Baltimore: Lippincott Williams & Wilkins, 7th ed,2000:2031- 40.
8. Çayköylü A, Coşkun İ, Kırkpınar İ, Özer H. Özkıyım girişiminde bulunanlarda sosyodemografik özellikler ve tanı dağılımı. Kriz Dergisi 1997;5:37-42.
9. Värnik P. Suicide in the World. Int. J. Environ. Res. Public Health 2012;9:760-71.
10. Keten HS, Hakkoymaz H, Aslan U, Bahar S, Keten A, Sucaklı MH, Bozkurt S. Acil Servise İntihar Girişimi Nedeniyle Başvuran Olguların İncelenmesi. Çağdaş Tıp Dergisi 2015; 5(2): 102-105. DOI:10.16899/ctd.18672.
11. Karacaoğlu E, Keten A, Akçan R, İçme F, Karagöl A, Avcı E. Bir eğitim ve araştırma hastanesi acil servisine intihar girişimi nedeniyle başvuran olguların incelenmesi. Adli Tıp Dergisi / Journal of Forensic Medicine, Cilt / Vol.:27, Sayı / No:1.
12. İntihar İstatistikleri 2014. Türkiye İstatistik Kurumu. Erişim Tarihi:19.06.2015. Erişim Adresi: http://www.turkstat.gov.tr/IcerikGetir.do?istab_id=23 .
13. Schmidtke A, Bille-Brahe U, DeLeo D et al. Attempted suicide in Europa: Rates trends and sociodemographic characteristics of suicide attempters during the period 1989- 1992. Acta Psychiatr Scand 1996;93:327-38.
14. Devlet İstatistik Enstitüsü: İntihar İstatistikleri 1997. Ankara, Devlet İstatistik Enstitüsü Matbaası, 1999.
15. Şengül CB, Serinken M, Şengül C, Bozkurt S, Korkmaz A. Acil Servise İntihar Girişimi Nedeniyle Başvurusu Ardından Psikiyatri Polikliniğinde Değerlendirilen Olguların Sosyodemografik Verileri. Türkiye Acil Dergisi 2008;8:127-31.
16. Ersan EE, Kılıc C. Evaluation of Suicide Attempts Referring to Sivas Numune Hospital Emergency Department. Klinik Psikiyatri 2013;16:98-109.
17. V Şenol, D Ünalan, L Avşaroğulları, İ İkizceli. İntihar girişimi nedeniyle Erciyes Üniversitesi Tıp Fakültesi Acil Anabilim Dalı'na başvuran olguların incelenmesi. Anadolu Psikiyatri Dergisi; 2005;6(1):19-29.

Research Article
Eurasian Journal of Critical Care

Evaluation of the Suicide Reasons and Anger Involved In Suicide Attempters Who Come to the Emergency Service

İbrahim Özlü[1], Zeynep Karaman Özlü[2], Halime Gökşan[3]
[1]Physician, Department Of Emergency Medicine, Atatürk University, Erzurum, Turkey
[2]Associate Professors, Faculty of Health Sciences, Atatürk University, Erzurum, Turkey
[3]Nursing, Department Of Emergency Medicine, Konya Training and Research Hospital, Konya, Turkey

Abstract

Aim: This study aimed to describe the reasons and the anger that drives patients to attempt suicide.

Materials and Methods: This is a descriptive study which was conducted with 217 patients that stayed in the Toxicology Intensive Care Unit and had attempted suicide. The data were collected during interviews conducted with the patients, using aquestionnaire form, which included questions on patients' personal information, and the Continuous Anger and Anger Expression Style Scale.

Results: All of the participating patients had taken medication or toxic substances in their attempt to commit suicide. Among the reasons attributed to the patients' attempts to commit suicide, 30% were based on familial issues, 23% on loneliness and harassment and 16.1% due to mental illnesses. Prior attempts at suicide had been committed by 20.3% of the patients, and 38.2% had been previously diagnosed with a psychiatric illness. In terms of the Continuous Anger and Anger and Expression Style score, the *Continuous Anger* sub-scale mean score was 27.34 (SD=6.33); the *State Anger* sub-scale mean score was 22.71 (SD=3.84); the *Controlled Anger* sub-scale mean score was 16.76 (SS=4.98); the *Expressed Anger* sub-scale mean score was 19.92 (SD=5.69); and the *Internalized Anger* sub-scale mean score was 18.71 (SD=3.98).

Conclusion: The study found that medication and toxic substances were the main means by which the patients attempted to commit suicide and that they were in their adolescent period and had low educational levels. Furthermore, those who had made prior attempts at suicide and/or who had been diagnosed with a psychiatric illness were included in the risk group. Lastly, the patients who attempted to commit suicide had high anger mean scores.

Keywords: Anger, Emergency service, Reasons for suicide, Suicide

Introduction

Suicide, defined as the act of killing yourself, as clearly demonstrated with evidence showingthe aim or intent to die, is currently a major public health issue (Sudak, 2007). In addition to being devastating for both families and communities, suicides are marked bymajor gender and social inequality gaps (World Health Organization, 2014). According to data provided by the World Health Organization (WHO), over 800,000 people commit suicide every year, and an even greater number attempt it. A previous suicide attempt is the most important risk factor for suicide in the general population. Of all suicides in the world, 75% occur in low and middle-income countries (World Health Organization, 2014). In the past 45 years, suicide rates have increased by 60% worldwide, and the global mortality rate is 16 out of 100,000. A case of suicide occurs every 40 seconds worldwide (World Health Organization, 2014). With a prevalence of 3.5%, suicide attempts are more frequent than those that are successfully carried out, and it is anticipated that more than 10% of those who commit suicide will make another attempt within 10 years (Suominen et al., 2004).

Data from WHO show that suicide is one of the leading causes of death in developed countries. It is the eighth leading cause of death following heart disease, cancer, cerebrovascular disease, accidents, diabetes, pneumonia and cirrhosis. It's been reported that suicide is the leading cause of death among persons between the ages of 15 and 44 and the second leading cause of death in those between the ages of 15 and 29 (World Health Organization, 2014).

There were a total of 6,708 suicides in the UK and the ROI in 2013.According to the records, there were 6,233 suicide cases in the UK in 2013. This corresponds to a rate of 11.9 per 100,000 population (19.0 per 100,000 for men and

Corresponding Author: Zeynep Karaman ÖZLÜ **e-mail:** zynp_krmnzl@hotmail.com
Received: 28.12.2018 • **Accepted:** 21.02.2019

5.1 per 100,000 for women) (World Health Organization, 2014). It has also been reported that the number of suicide attempts is 10 times larger than those resulted in death (Sudak, 2007). The Turkish Statistical Institute (TurkStat) has been compiling suicide statistics in Turkey since 1962 and announcing them since 1974. According to 2013 data, the number of suicide attempts that resulted in death were 3,252. This number increased to 3,065 in 2014. Of those who committed suicide, 74.3% were males and 25.5% were females. The rate of suicide, which is the number of suicides per 100,000 people in a population, was 4.27 in 100,000 population in 2013, while it was 3.97 in 2014. In other words, four out of 100,000 people committed suicide in 2014 (Turkish Statistical Institute, 2014).

Of the unsuccessful attempts at suicide by individuals, 90 to 95% of them suffered from a psychiatric disorder, with the leading one being major depression (Devrimci, 2008). Affective disorder, chronic anxiety, behavioral disorder and substance abuse also were shown to increase the risk of suicide (Ebert et al., 2013). Suicidal thoughts and plans were other factors that increase the risk of suicide attempts, while prior suicide attempts were an indicator of a high risk of suicide (Beghi & Rosenbaum, 2010).

According to studieson the clinical characteristics of adolescents who attempt to commit suicide, this particular group is impulsive and angry, and tends to be violent, introvertedand over-sensitive. They also have perfectionist personality traits (Sahin, Onur, & Basim, 2008). From a clinical perspective, it has been observed that anger and internal destructive drives are predictive factors for suicide among adolescents (Batigun & Sahin, 2003).

If anger is not expressed and externalized in appropriate ways, it can cause physical, psychological and social problems (Albayrak & Kutlu, 2009; Starner & Peters, 2004). The expression of anger is the externalization of anger verbally and/or in behavioral ways and serves as an adaptive reaction in handling stress (Albayrak & Kutlu, 2009; Starner & Peters, 2004; Wolf & Foshee, 2003). When a person does not control their anger in a healthy way, they reflect it onto to themselves or project it ontothose around them, exhibit aggressive behavior and show violence (Herrmann & McWhirter, 2003). The classical theory of psychoanalysis argues that internal anger is actually the suppression of anger, which transfers the existing energy back into the interior, and is therefore included in the etiology of depression (Turkcapar et al., 2004). Freud claimed that mourning and melancholia were triggered by actual or symbolic losses. He explained the feelings of self-accusation and suicide in depressive patients as the self-direction of the anger against the lost object in the form of the desire to harm oneself (Odag, 2008).

The aim of this study was to identify the reasons patients had for attempting suicide, and to determine their state anger.

Materials and Methods

Design

This research wasconducted as a descriptive study involving patients placed in the Konya Training and Research Hospital's Toxicology Intensive Care Unit between October 2014 and December 2014. The study population included the patients who presented to the emergency service at the Konya Training and Research Hospital due to suicide attempt between the given dates and stayed in the Toxicology Intensive Care Unit located in the emergency service. The study sample included 217 patients who were 15 years of age or older, agreed to participate in the study, were able to communicate and met the research criteria. All cases who come to the emergency service due to suicide attempt are taken to the Toxicology Intensive Care Unit in the emergency service, and all treatment initiatives are performed in this unit.

Data Collection Tools

The study data were collected using the Patient Description Form and the Continuous Anger and Anger Expression Style Scale (CAAESS).

Patient Description Form

The author created this form based on the relevant literature. This form included questions about patients' socio-demographic characteristics (e.g. age, gender, marital status, educational status, household, place of residence, income level, person who raised the patient) andquestions seeking to determine what might have been the cause of the suicide attempt (e.g. state of family in childhood, reason for suicide, past suicide attempts, past suicide attempts in family, past psychiatric diagnosis, past psychiatric diagnosis in the family, psychiatric therapy received in the past six months).

The Continuous Anger and Anger Expression Style Scale (CAAESS)

This scale was created by Spielberger et al. (1983) and translated into Turkish by Ozer (1994). It measures anger and anger expression. The scale consists of the following two sections.

Continuous Anger Scale

This scale consists of two sub-dimensions, Continuous Anger and State Anger. Continuous Anger is indicated by the total score of the first 10 items, while State Anger is indicated by the total score of the second 10 items.

Anger Expression Style Scale

This scale consists of three sub-dimensions,Controlled Anger, Expressed Anger and Internalized Anger. Controlled Anger is indicated by the total score of items 11, 14, 18, 21, 25, 28, 30 and 34 (eight items); Expressed Anger is indicated by the total score of items 12, 17, 19, 22, 24, 29, 32 and 33 (eight items); and Internalized Anger is indicated by the total score of items 13, 15, 16, 20, 23, 26, 27 and 31 (eight items).

Higher scores on the Continuous Anger sub-dimension indicate a high level of anger; higher scores on the Controlled Anger sub-dimension indicate that the person is capable of controlling their anger; higher scores on the Expressed Anger sub-dimension indicate that the person expresses their anger easily and higher scores on the Internalized Anger sub-dimension indicate that the anger is suppressed.

The Cronbach's alpha coefficient of the scale is 0.77, while for this studythe Cronbach's alpha coefficient was 0.76.

Data Collection

The author collected the study data at the time of the interviews, which were held during working hours (08:00-16:00 and 16:00-08:00). The patients were informed about the study objective and the author also obtained their verbal consent. It took approximately 10 minutes to administer the data collection forms.

Data Analysis

The study data were analyzed and encoded using the Statistical Package for the Social Sciences for Windows (SPSS) 16.0 software program. Assessments of the study data were carried out using the x2 test, independent samples t test, Kruskal–Wallis analysis of variance, and the Mann-Whitney U test.

The study data were analyzed in the electronic environment using percentages, mean scores and the chi-square test. The significance level of the study was set at 0.05. Values below 0.05 were considered statistically significant, while values above it were considered statistically insignificant. To determine the significance between the groups, the author used LSD, one of the post hoc tests, where the number of groups was three or more, since the variance between the groups was equal.

Ethical Approval

Approval was obtained from Ataturk University's Health Sciences Institute's Ethics Committee before conducting the study, and written consent was obtained from the study participants after presenting them with an information form including the objective and the extent of the study. The patients were informed verbally about the aim of the study because using the human cases in the study requires the protection of the individual rights. The patients were informed that the individual information patients shared with the researcher will be preserved. It was explained to them if they had the option not to participate in the study. Thus the "Informed consent", "Autonomy", "Privacy and Protection of Privacy" ethical principles were met and verbal permission were received from the patients.

Results

All participating patients had attempted to commit suicide by taking medication or toxic substances.

An analysis of the personal information of the participating patients (Table 1) revealed that a majority of the patients were between 15 and 24 years of age, female, single, completed their elementary education, unemployed and lived in the city with their parents, had a high income level, raised with sufficient care in their childhood and had families that were not fragmented.

Among the reasons for patients' attempting to commit suicide, 30% were attributed to family-related issues, 23% to loneliness and/or harassment, 16.1% to mental illnesses, 13.4% to economic problems, 12% to problems with the opposite sex and 8.8% to alcohol and substance addiction. Furthermore, 20.3% of the patients had attempted suicide in the past, 2.3% had had a family member who attempted suicide in the past, 38.2% had been diagnosed with a psychiatric disease before, 3.7% had a family member who had been diagnosed with a psychiatric disease and 29% had received psychiatric therapy within the last six months.

The distribution of the mean scores on CAAESS is presented on Table 2. The participatingpatients' mean score on the Continuous Anger sub-dimension of the Continuous Anger Scale was 27.34 (SD=6.33), and the State Anger mean score was 22.71 (SD=3.84).

Participants' mean score on the Controlled Anger sub-dimension of the Anger Expression Style Scale was 16.76 (SD=4.98), 19.92 (SD=5.69) on the Expressed Anger sub-dimension and 18.71 (SD=3.98) on the Internalized Angersub-dimensions.

A comparison of the patients' mean scores on CAAESS according to their personal characteristics (Table 3) revealed that participants between the ages of 15 and 24 had significantly higher mean scores on the State Anger and Controlled Anger sub-dimensions, while those who were 35 and older obtained statistically significant high mean scores on the Internalized Anger sub-dimension ($p<0.05$). It was found that the reason forthis significance was that the groups included participants between the ages of 15 and 24.

According to the study findings, patients who lived alone had significantly high mean scores on the State Anger sub-dimensions, whereas those who lived with their families

Table 1. Distribution of patients' personal information

Characteristics	Number (N= 217)	Percentage
Age		
15-24	126	58.1
25-34	56	25.8
35 and older	35	16.1
Gender		
Female	133	61.3
Male	84	38.7
Marital Status		
Married	94	43.3
Single	123	56.7
Educational Level		
Non-educated	19	8.8
Elementary Education	126	58.1
High School	55	25.3
Undergraduate	17	7.8
Employment Status		
Employed	75	34.6
Unemployed	142	65.4
Household		
Living alone	9	4.1
Only spouse	13	6.0
Spouse and children	54	24.9
Parents	83	38.3
Other (e.g. roommates)	58	26.7
Residence		
Village	21	9.7
Town	20	9.2
City	176	81.1
Income Level		
Low	15	6.9
Moderate	57	26.3
High	145	66.8
Who were you raised by?		
Mother	23	10.6
Both parents	183	84.3
Other (e.g. nanny)	11	5.1
Childhood Care		
Extreme	28	12.9
Sufficient	152	70.0
Neglected	37	17.1
State of Family in Your Childhood		
Together	181	83.4
Fragmented	36	16.6
Reason for Suicide*		
Family	65	30.0
Loneliness, Harassment	50	23.0
Mental illness	35	16.1
Economic	29	13.4
Problems with the opposite sex	26	12.0
Alcohol and Substance Addiction	19	8.8
Communication problems	17	7.8
Developmental period problems	14	6.5
Domestic violence	12	5.6
Death/Loss	11	5.1
Exam anxiety	9	4.1
School	6	2.8
Job	6	2.8
Disease	6	2.8
Marriage	5	2.3
Children	4	1.8
Arguing parents	4	1.8
Sexual problems	2	0.9
Not having a home to live in	1	0.5
Chronic condition	1	0.5
Past suicide attempts		
Yes	44	20.3
No	173	79.7
Past suicide attempts in family		
Yes	5	2.3
No	212	97.7
Past psychiatric diagnosis		
Yes	83	38.2
No	134	61.8
Past psychiatric diagnosis in the family	8	3.7
Yes	209	96.3
No		
Psychiatric therapy received in the past six months	63	29.0
Yes	154	71.0
No		

*Multiple options are checked.

had significantly high mean scores on the Controlled Anger sub-dimension ($p<0.05$). The significance was due to the group including patients who lived with people other than their families.

An analysis of patients' mean scores by their income levels revealed that those who had a high income level had higher mean scores on the Controlled Anger sub-dimension than those who had moderate and low income levels ($p<0.05$). The statistical significance between income levels and Controlled Anger was due to the group with the low income level.

The patients who reportedthat they had not been provided with much care in their childhood had higher mean scores on the State Anger sub-dimension while those who reported that they were provided an extreme level of care obtained higher mean scores on the Controlled Anger sub-dimension ($p<0.05$). It was found that the reason forthis statistical significance was that the group included patients who did not receive enough attention when being raised. The patients who lived in families that were not fragmentedduring their childhood obtained higher mean scores than those who lived in fragmented families ($p<0.05$).

The patients who had attempted suicide before had higher scores on the Continuous Anger and Expressed Anger sub-dimensions while those who had not attempted suicide had higher scores on the Controlled Anger sub-dimension ($p<0.05$). Regarding the patients who had been diagnosed with psychiatric disorders and had received psychological therapy within the last six months, they had higher mean scores on the Continuous Anger, Expressed Anger andInternalizedAnger sub-dimensions, while those who were not diagnosed with a psychiatric disorder obtained higher mean

Table 2. The distribution of minimum and maximum scores on CAAESS and the mean score

Scale		Range	Mean Score±SD
Continuous Anger	Continuous Anger	11-40	27.34±6.33
	State Anger	14-38	22.71±3.84
Anger Expression Style	Controlled Anger	8-29	16.76±4.98
	Expressed Anger	8-32	19.92±5.69
	Internalized Anger	10-31	18.71±3.98

scores on the Controlled Anger sub-dimension ($p<0.05$). The reason for the statistical significance hereis that the group included the patients who did not have any past suicide attempts and did not receive any psychiatric diagnosis.

There was no statistically significant difference between the patients in terms of gender, marital status, educational levels, employment status, residence, past suicide attempts in the family and prior diagnosisof psychiatric disordersand CAAESS mean scores ($p>0.05$).

Discussion

Suicide currently presentsa major public and mental health issue and is a leading cause of death worldwide. All indications suggest that this issue will continue to remain at its current level (Altindag, Sir, & Ozkan, 2001). It is therefore imperative to develop strategies that are able to identify high-risk cases in the effort to prevent suicidal behavior. This study aimed to analyze the reasons and the different types and expressions of anger in patients who attempted to commit suicide and then presented the study findings to facilitatea discussion based on the information provided in the relevant literature.

Overdosing on medication is one of the most frequent methods used in suicide attempts. Many of the studies conducted in Turkey also revealed that this was the mostly frequently used method (Gidis et al.,1997; Bitlis et al., 1994; Sayil et al., 1993). In another study, it was determined that 94.73% of those attempting suicide took medication to carry it out (Tezcan, Oguzhanoglu, & Ulkeroglu, 1995). This present study found that all of the patients took either medication or toxic substances to commit suicide.

According to WHO data, the prevalence of suicide is higher among males compared to females, except in China(World Health Organization, 2014). The relevant literature indicates that while the rate of completed suicides is higher among males, the rate of suicide attempts is higher among females. The ratio of females attempting suicide to males ranges between 3/1 and 9/1 (World Health Organization Website, 2014; Akin & Berkem, 2012; Eskin, 2012; Ercan, Varan, & Aydın, 2000; Tsirigotis, Gruszczynski, & Tsirigotis-Woloszczak, 2011). In the U.S., the number of suicide attempts among females is three times higher than it is among males. On the other hand, the number of completed suicides among males is three times higher than it is among females. This study also found that suicide attempts were more common among females than they were among males. The study conducted by Devrimci, Ozguven and Sayil (2003) between 1998 and 2001 in Ankara found that the rate of annual suicide attempts among males was 46.89/100000 and 112.89/100000 among females. This difference between the rates results from the fact that females are more inclined to ask for help when they have mental problems and that the role of "patient" is less stigmatizing for females than it is for males. Apart from these, researchers have put forward many opinions to explain the reasons for the high rate of suicide attempts among females and high rate of completed suicides among males. Some of these reasons are that females are not as impulsive as males, alcohol and drug addiction is rarer among females, females tend to prefer less fatal and painful methods to commit suicide, such as medication, and females build much more intimate relationships than males do and have stronger social support networks (Sudak, 2007; Oto, Ozkan, & Altindag, 2004). The fact that major depression, one of the most important risk factors for suicide, is more common among females serves as another reason for the higher rate of suicide attempts among females.

When suicidal behavior is addressed by age, it is observed that the rates of completed suicide are different. The highest rate of completed suicides worldwide occurs among those older than 65. However, reports have shown that a majority of deaths caused by suicides in the last 20 years are among those between the ages of 15 and 44 and that the rate of suicide among young persons is increasing rapidly (World Health Organization Website, 2014). In Turkey, the studies that have been conducted indicate that females between 15 and 24 years of age and males between 20 and 35 years of age have a higher risk of suicide (Devrimci-Ozguven & Sayil, 2003). Similarly, the results of this studyshowed thatthe patients who attempted suicide were between 15 and 24 years of age, and that their mean anger scores were significantly higher than those of the other age groups. Suicidal thoughts and suicide rates are increasing rapidly among young persons in many countries (Oto, Ozkan, & Altindag, 2004). A study conducted in Ankara screened the applications citing suicide attempts made to the emergency services and determined that attempts were increasing among those between

Table 3. A comparison of patients' CAAESS mean scores according to their personal characteristics

Characteristics	Continuous Anger		Anger Expression Style		
	Continuous Anger	State Anger	Controlled Anger	Expressed Anger	Internalized Anger
	$\overline{X}$ ± SD	$\overline{X}$ ± SD	$\overline{X}$ ± SD	$\overline{X}$ ± SD	$\overline{X}$ ± SD
Age					
15-24	27.21±6.01	23.27±3.69	17.63±4.91	19.36±5.48	18.51±3.93
25-34	26.71±6.36	21.71±4.07	16.46±4.83	19.96±5.94	18.16±3.83
35 and older	28.80±7.28	22.31±3.73	14.11±4.59	21.88±5.75	20.31±4.12
Significance	p>0.05	**p<0.05**	**p<0.05**	p>0.05	**p<0.05**
Gender					
Female	27.57±6.37	22.81±3.64	16.69±4.84	19.96±5.97	18.88±4.28
Male	26.96±6.27	22.55±4.16	16.88±5.23	19.86±5.26	18.44±3.45
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Marital Status					
Married	27.55±6.29	22.26±3.92	16.12±4.99	20.14±6.01	18.82±4.05
Single	27.17±6.37	23.06±3.76	17.25±4.94	19.75±5.45	18.62±3.94
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Educational Level					
Non-educated	30.73±7.14	22.42±4.20	14.89±6.11	22.84±6.51	20.21±3.44
Elementary Education	27.08±6.42	22.48±3.64	16.79±4.98	19.53±5.62	18.67±3.92
High School	26.85±5.53	22.83±4.37	17.00±4.86	19.65±5.30	18.20±4.24
Undergraduate	27.00±6.53	24.41±2.82	17.88±3.70	20.41±6.03	19.00±4.01
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Employment Status					
Employed	26.77±6.50	22.61±3.81	17.06±5.52	19.44±5.64	18.48±3.51
Unemployed	27.64±6.24	22.77±3.87	16.60±4.69	20.18±5.72	18.83±4.21
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Household					
Living alone	31.44±4.53	24.44±6.24	15.22±6.32	24.00±4.71	20.22±4.65
Only spouse	28.61±5.89	24.07±4.17	17.15±5.81	21.92±6.52	20.07±4.53
Spouse and children	26.44±6.78	21.75±3.87	15.92±4.60	19.53±6.30	18.25±3.65
Parents	26.63±5.82	23.67±3.53	18.03±4.50	19.62±4.99	18.80±4.07
Other	28.25±6.69	21.67±3.26	15.87±5.32	19.63±5.83	18.46±3.9 p>0.05
Significance	p>0.05	**p<0.05**	**p<0.05**	p>0.05	
Residence					
Village	26.95±6.21	23.14±4.71	16.57±4.75	19.61±4.99	20.00±4.57
Town	29.50±6.07	23.20±3.60	16.10±4.19	19.95±5.20	19.80±4.31
City	27.14±6.36	22.61±3.77	16.86±5.11	19.96±5.84	18.43±3.84
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Income Level					
Low	28.13±7.52	22.86±4.08	13.33±4.18	20.73±5.98	19.86±4.80
Moderate	28.07±6.21	21.80±3.60	15.70±4.53	20.68±5.58	18.98±3.97
High	26.97±6.26	23.06±3.88	17.53±5.03	19.54±5.71	18.48±3.89
Significance	p>0.05	p>0.05	**p<0.05**	p>0.05	p>0.05
Who were you raised by?					
Mother	28.26±6.54	23.13±3.55	16.30±4.81	20.65±5.83	18.65±3.96
Both parents	27.22±6.37	22.62±3.93	17.00±4.94	19.77±5.63	18.68±4.05
Other (Nanny)	27.36±5.46	23.45±2.94	13.72±5.38	20.90±6.71	19.36±3.00
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Care Provided to You in Your Childhood					
Extreme	26.25±6.58	23.42±2.98	18.75±5.00	19.00±6.24	18.28±4.31
Sufficient	27.46±6.40	22.34±4.07	16.78±4.97	19.71±5.54	18.46±3.97
Neglected	27.67±5.90	23.72±3.22	15.16±4.59	21.48±5.74	20.05±3.55
Significance	p>0.05	**p<0.05**	**p<0.05**	p>0.05	p>0.05
State of Family in Your Childhood					
Together	27.32±6.44	22.67±3.95	17.08±4.88	19.77±5.63	18.70±4.03
Fragmented	27.44±5.78	22.91±3.26	15.16±5.24	20.66±6.02	18.77±3.78
Significance	p>0.05	p>0.05	**p<0.05**	p>0.05	p>0.05

Past suicide attempts					
Yes	31.20±5.66	22.36±3.53	14.27±5.12	22.88±5.44	19.31±4.08
No	26.35±6.12	22.80±3.92	17.39±4.76	19.17±5.52	18.56±3.95
Significance	**p<0.05**	p>0.05	**p<0.05**	**p<0.05**	p>0.05
Past suicide attempts in family					
Yes	24.80±4.32	20.40±4.33	16.60±5.68	19.00±1.87	17.00±2.00
No	27.40±6.36	22.77±3.82	16.76±4.98	19.94±5.75	18.75±4.01
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Past psychiatric diagnosis					
Yes	29.18±5.69	22.67±3.41	15.63±4.71	21.43±5.43	19.63±3.84
No	26.20±6.45	22.74±4.09	17.46±5.03	18.99±5.66	18.14±3.97
Significance	**p<0.05**	p>0.05	**p<0.05**	**p<0.05**	**p<0.05**
Past psychiatric diagnosis in the family					
Yes	28.37±6.36	24.25±1.83	14.00±4.89	20.87±5.61	22.37±3.88
No	27.30±6.34	22.66±3.89	16.87±4.97	19.89±5.70	18.57±3.92
Significance	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Psychiatric therapy received in the past six months					
Yes	29.90±5.91	22.76±3.33	15.17±4.94	21.98±5.73	20.09±3.85
No	26.29±6.21	22.70±4.04	17.41±4.87	19.08±5.47	18.14±3.90
Significance	**p<0.05**	p>0.05	**p<0.05**	**p<0.05**	**p<0.05**

the ages of 15 and 24 in particular (Sayil et al., 1993). Many factors influence suicidal behaviors in adolescents. Batigun and Sahin (2003)determined that anger and aggressiveness increased between the ages of 14 and 24, and that the risk of suicide also increased among those with particularly high levels of impulsiveness. Carli et al. (2010) found that young persons were more impulsive and that those with higher levels of impulsiveness were more inclined to suicide. Another reason for the high rate of suicides among adolescents can be attributed tothe fact that most psychiatric illnesses begin in this period and that adolescent patients are unableto comprehend the importance of symptoms and therefore rarely seek or accept therapy (Bakım, Özçelik, & Karamustafalıoğlu, 2007).Moreover, the persons in this age group have significantly higher state anger mean scores. This implies that they have insufficient problem solving skills and high levels of anger, aggressiveness and impulsiveness, which makes them consider suicide as an immediate solution when they face a stressful incident or situation. Therefore, there is an increased probability of suicide in these individuals.

Suicide is more commonly seen among single and divorced persons, as well as widows and widowers and married couples who live inseparate residences. In support of this evidence, many studies haveshown that marriage acts as a protective factor (Demirel & Esel, 2003; Ekici, Savas, & Citak, 2001). The present study also found that suicide attempts among single patients were more common than they were among married patients. The author believes the reason for this is that married persons make better use of social support systems. The number of suicides is twice as larger among single persons than it is among married individuals and four or five times larger than it is among individuals who are divorced or separated (Demirel & Esel, 2003). The household living arrangement is also an important factor in suicide attempts. According to the findings of this study, those who lived with their parents had higher mean scores of Controlled Anger. Individuals who had a warm family environment and felt that they were supported by their families were able to express their anger in a healthy way and also to control it adequately. On the other hand, persons who felt that their family environment was controlling and authoritativeexperienced anger more frequently, were not able to express their feelings in a comfortable way, needed to control these feelings and mostly directed their anger inwards, towards themselves.

According to various reports, one of theuniversal features of suicidal behavior is that those who demonstrateit have a low educational level (Agerbo, Nordentoft, & Mortensen, 2002; Turkish Statistical Institute, 2014). The studies conducted in Turkey also show that suicidal behavior is more common among those with a loweducation level (Gulec& Aksaray, 2006; Deveci et al., 2005; Sayil et al., 2000).In contrast, individuals who have a high education level are able to control their anger in a healthier manner, as education has been shown to have a positive effect on the reflection of anger. Sayil et al. (2000) found that 93% of those who attempted suicide had a high school or lower level of education. A cohort study conducted with 898,342 students in Sweden determined that the risk of suicide increased among those who had low levels of school achievement and graduated

with lower grades, all of which led toanger, desperation, unhappiness and low confidence (Björkenstam et al., 2011). According to the findings of this study, the highest rate of suicide attempts and the highest level of anger were among elementary school graduates, while the second highest rates were among high school graduates. The anger mean scores of those with low educational levels were high but not statistically significant. These results show that increasing the educational level isone of the most important strategies for preventing suicides in any given society.

The prevalence of unemployment is high in both suicides and suicide attempts (Agerbo et al., 2002; Cheng, Chen, & Jenkins, 2000). The pace of suicides is higher among the unemployed compared to the employed. The present study also found that the suicide rate was higher among the unemployed. The anger level of the unemployed group was higher than the employed group but not statistically significant. Having a job acts as a preventive against suicide. Suicide rates increase in times of economic depression and high unemployment rates, whereas it decreases in periods when the economy is in a good state (Devrimci, 2008).

The studies conducted on therisks of suicide associated with family matters determined that the major factors werethe presence of a suicide attempt in family history, domestic violence, mental illnesses in family history, physical and sexual harassment, insufficient social support, communication problems in family and negative economic status of the family (Agerbo et al., 2002; Brent et al., 2002; Cheng et al., 2000; Ozguven et al., 2003; Tsai et al., 2002). Among young persons, insufficient levels of communication in family, eitherexcessive or little to no expectations of parents for their children and excessive controlling behavior by parents towards their children are factors that were shown to increase suicides or suicidal attempts (Beautrais, 2000). In accordance with the relevant literature, thepresent study found that the most common reasons for suicide were family-related issues, loneliness, harassment, mental illnesses, economic problems and problems involving the opposite sex. Moreover, those who lived in fragmented families had lower mean scores in Controlled Anger. Usually, those who had weak anger control and behaved aggressively did not socialize enough in their family environment. Inconsistent and disinterested behavior of parents prevent adolescents from making a distinction between acceptable and unacceptable behavior. This may be the reason for the individuals' anger and aggressive behavior.

One of the most important risk factors for suicide is past suicide attempts (Tsai et al., 2002; Gould & Kramer, 2001; Beautrais, 2000). Of the completed suicides, 19 to 24% had past suicide attempts and of these attempts, 10% resulted in suicide within 10 years (Owens, Horrocks, & House, 2002). This study found that 20% of those who had committed suicide had attempted to do it before and that 38.2% had been diagnosed with a psychiatric illness. A history of suicide attempts isaccepted to be an obvious risk factor, not only for completed suicides but also for suicide attempts. Community samples have shown that 10% of the adolescents who have attempted suicide make two or more attempts within two years (Akin, & Berkem, 2012). In addition, those who had past suicide attempts had higher scores in State Anger and Expressed Anger. The relevant studies indicate that those who have past suicide attempts feel angrier in general.

The Continuous Anger sub-scale, one of the two major sub-scales of the Continuous Anger and Anger Expression Style Scale, reveals the general feelings of the person or the degree of their anger. This study found that those who attempted suicide had high continuous anger total scores. Anger and aggressive behavior are considered important risk factors for suicidal behavior. There are many studies that support the correlation between aggressiveness, impulsive behavior and suicide (Michaelis et al., 2004; Zouk et al., 2006).

Internal anger is an alternative adjustment mechanism. Persons tend to use it to conceal their anger or to keep it insidefor use against the pre-existing anger elements (Starner & Peters, 2004). According to the study findings, the internal anger scores of the patients were high. Akin and Berkem (2012) also determined that individuals who had past suicide attempts obtained high continuous anger scores. According to the classical theory of psychoanalysis, anger is included in the etiology of depression (Odag, 2008). The most common diagnosis among patients who attempt suicide is depression, which proves that high anger scores are very important for identifying high risk cases.

Conclusion and Suggestions

The increase seen in suicide rates in Turkey and throughout the world necessitates that studies be conducted on this issue. This study determined that medication and toxic substances were the primary means by which suicide attempts were carried out. Additional data from the study showed that the majority of suicide attempts were madeby adolescents with low educational levels, that suicide attempts were more common among females, that the presence of prior suicide attempts and psychiatric diagnoses triggered attempts to commit suicide and that those who had completed suicides had high anger scores.

The individuals who attempt suicide are usually adolescents. This implies that training adolescents about anger management and providing them with psycho-therapeutic and psycho-pharmacological training will help reduce the risk of suicide. In addition, it is recommended that individuals with past suicide attempts and psychiatric diagnosis be taken to school nurses or Guidance and Counseling Centers to determine their suicide risks, and following the provision of counseling, these individuals should be directed to a psychiatric clinic.

References

1. Agerbo, E., Nordentoft, M., & Mortensen, P. (2002). Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study. *BMJ, 325*(7355), 74.
2. Akin, E., & Berkem, M. (2012). An analysis of psychiatric diagnoses and demographic and clinical characteristics of the adolescents who have attempted to commit suicide. *Firat Medical Journal, 17*(4), 228-232.
3. Albayrak, B., & Kutlu, Y. (2009). Anger expression style in adolescents and correlated factors. *Maltepe University the Science and Art of Nursing Journal, 2*(1), 57-61.
4. Altindag, A., Sir, A., Ozkan, M., & (2001). The changes in suicide speed in Turkey (1974-1998). *Psychiatry in Turkey, 2*, 79-86.
5. Bakım, B., Özçelik, B., & Karamustafalıoğlu, O. (2007). Suicidal Behavior in Psychiatric Disorders. *Düşünen Adam: The Journal of Psychiatry and Neurological Sciences, 20*(1), 38-47.
6. Batigun, A., & Sahin, N. (2003). Could anger, impulsiveness and insufficient problem-solving skills be a predictor of adolescent suicides? *Turkish Psychology Journal., 18*(51), 37-52.
7. Beautrais, A. (2000). Risk factors for suicide and attempted suicide among young people. . *Australian New Zealand J Psychiatry, 34*(420-436.).
8. Beghi, M., & Rosenbaum, J. F. (2010). Risk factors for fatal and nonfatal repetition of suicide attempt: a critical appraisal. *Current Opinion in Psychiatry, 23*(4), 349-355.
9. Bitlis, V., Tuzer, T., Bayam, G., Dilbaz, N., Holat, H., & Tan, D. (1994). A retrospective analysis of the patients coming to the emergency unit in a public hospital for suicide attempt. *Kriz Journal, 2*(2), 323-326.
10. Björkenstam, C., Weitoft, G. R., Hjern, A., Nordström, P., Hallqvist, J., & Ljung, R. (2011). School grades, parental education and suicide—a national register-based cohort study. *Journal of epidemiology and community health, 65*(11), 993-998.
11. Brent, D. A., Oquendo, M., Birmaher, B., Greenhill, L., Kolko, D., Stanley, B., . . . Ellis, S. (2002). Familial pathways to early-onset suicide attempt: risk for suicidal behavior in offspring of mood-disordered suicide attempters. *Archives of general psychiatry, 59*(9), 801-807.
12. Carli, V., Jovanović, N., Podlešek, A., Roy, A., Rihmer, Z., Maggi, S., . . . Sarchiapone, M. (2010). The role of impulsivity in self-mutilators, suicide ideators and suicide attempters—A study of 1265 male incarcerated individuals. *Journal of affective disorders, 123*(1), 116-122.
13. Cheng, T., Chen, T., Chen, C., & Jenkins, R. (2000). Psychosocial and psychiatric risk factors for suicide Case—control psychological autopsy study. *The British Journal of Psychiatry, 177*(4), 360-365.
14. Demirel, O., & Esel, E. (2003). Suicide (Ozkiyim). *Anatolian Psychiatry Journal., 4*, 175-118.
15. Deveci, A., Taskin, E. O., Dundar, P. E., Demet, M. M., Kaya, E., Ozmen, E., & Dinc, G. (2005). The prevalence of suicidal thought and attempts in Manisa. *Turkish Psychiatry Journal., 16*(3), 170-178.
16. Devrimci-Ozguven, H., & Sayil, I. (2003). Suicide attempts in Turkey: results of the WHO-EURO Multicentre Study on Suicidal Behaviour. *Canadian Journal of Psychiatry, 48*(5), 324-329.
17. Devrimci, O. (2008). An Analysis of the Risk of the Suicidal Behavior Clinics in Turkey. *Journal of Psychiatry- Special Topics, 1*(3).
18. Ebert, M., Loosen, P., Nurcombe, B., & Leckman, J. (2013). *Current Diagnosis and Treatment" Series, Psychiatric Diagnosis or Therapy* (S. Candansayar Ed. 2 ed.): Ankara Gunes Tip Kitabevleri.
19. Ekici, G., Savas, H., & Citak, S. (2001). Psychological factors which increase the risk of suicide (lack of social security, immigration and other stressors. *Anatolian Psychitary Journal, 2*(4), 204-212. .
20. Ercan, E., Varan, A., & Aydın, C. (2000). The Sociodemographic, Psychiatric, and Familial Aspects of Adolescents Who Attempted Suicide. Çocuk ve Gençlik Ruh Sağlığı Dergisi/ Turkish Journal of Child and Adolescent Mental Health, 7(2), 81-91.
21. Eskin, M. (2012). *Suicide: Explanation, Evaluation and Treatment and Prevention. Section 5: Risk Factors*. Ankara: HYB Basim Yayin.
22. Gidis, D., Kaya, N., Çilli, A. S., Ozkan, I., & Şahinoglu, U. (1997). An analysis of the adolescents coming to Selcuk University's Faculty of Medicine for suicide attempt. . *Kriz Journal, 5*, 37-42.
23. Gould, M. S., & Kramer, R. A. (2001). Youth suicide prevention,. *31*, 6-31.
24. Gulec, G., & Aksaray, G. (2006). An analysis of socio-demographic, socio-cultural and familial characteristics of young persons who attempt suicide.*New Symposium Journal,, 44*(3), 141-150.
25. Herrmann, D. S., & McWhirter, J. J. (2003). Anger & aggression management in young adolescents: An experimental validation of the SCARE program. *Education and Treatment of Children*, 273-302.
26. Odag, C. (Ed.). (2008). *Suicide (Ozkiyim) Description-Theory-Therapy.New Mental Reconstruction,* (3 ed.). İzmir: Odag Psikanaliz ve Psikoterapi Egitim Hizmetleri Yayinlari.
27. Oto, R., Ozkan, M., & Altindag, A. (2004). Suicides in Batman. Clinics in Turkey. *Journal of Psychiatry- Special Topics, 5*(2), 74-100.
28. Owens, D., Horrocks, J., & House, A. (2002). Fatal ad nonfatal repetition of self-harm. . *The British Journal of Psychiatry, 181*, 183-189.
29. Ozguven, H. D., Soykan, Ç., Haran, S., & Gencoz, T. (2003). The importance of problem solving skills and perceived social support as well as depression and anxiety symptoms in suicide attempts. *Turkish Psychology Journal, 18*, 1-11.
30. Sahin, H., Onur, A., & Basim, H. (2008). Predicting the Suicide Probability by Anger, Impulsiveness and Deficiency in Problem Solving Skills. *Turkish Psychology Journal, 23* (62), 79-88.
31. Sayil, I., Berksun, O. E., Palabiyikoglu, R., Ozguven, H., Soykan, C., & Haran, S. (2000). Crisis and Intervention in Crisis: Suicide Behavior. *Ankara University Psychiatric Crisis Research and Implementation Center Publishing,, 6*, 165-197.
32. Sayil, I., Oral, A., Guney, S., Ayhan, N., Ayhan, O., & Devrimci, H. (1993). A study on the suicide attempts in Ankara. *Kriz Journal, 1*, 56-61.
33. Starner, T., & Peters, R. (2004). Anger expression and blood pressure in adolescents. *The Journal of School Nursing, 20*(6), 335-342.
34. Sudak, H. (Ed.). (2007). *Kaplan&Sadock's Comprehensive Textbook of Psychiatry.* (8 ed. Vol. 34). Ankara: Ankara Gunes Kitabevi Ltd. Sti.

35. Suominen, K., Isometsä, E., Suokas, J., Haukka, J., Achte, K., & Lönnqvist, J. (2004). Completed suicide after a suicide attempt: a 37-year follow-up study. *American Journal of Psychiatry, 161*(3), 562-563.
36. Tezcan, A., Oguzhanoglu, N., & Ulkeroglu, F. (1995). Suicide attempts in children and young people.*Kriz Journal, 3* (1- 2), 70-74. .
37. Tsai, S.-Y. M., Kuo, C.-J., Chen, C.-C., & Lee, H.-C. (2002). Risk factors for completed suicide in bipolar disorder. *Journal of Clinical Psychiatry*.
38. Tsirigotis, K., Gruszczynski, W., & Tsirigotis-Woloszczak, M. (2011). Gender differentiation in methods of suicide attempts. *Annals of Transplantation, 17*(8), PH65-PH70.
39. Turkcapar, H., Guriz, O., Ozel, A., Isik, B., & Donbak Orsel, I. (2004). The correlation between anger and depression in patients with antisocial personality disorder. *Turkish Psychiatry Journal., 15*, 119 -124.
40. Turkish Statistics Institutions (2014) Statistics of Suicide, Available from: www.tuik.gov.tr.
41. Wolf, K. A., & Foshee, V. A. (2003). Family violence, anger expression styles, and adolescent dating violence. *Journal of Family Violence, 18*(6), 309-316.
42. World Health Organization. 2014. Preventing Suicide: A Global Imperative, Available from: http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/

Research Article
Eurasian Journal of Critical Care

Assessment of Patients Diagnosed With Aortic Dissection in Our Emergency Department During the Past Five Years

Ali Gür MD[1], Hakan Oğuztürk[2], Barış Akça MD[3], Muhammet Gökhan Turtay[2], Kasım Turgut MD[4], Şükrü Gürbüz[2], Taner Güven MD[5], Nevzat Erdil MD[3], Sedat Özbay MD[6]

[1]Van Educuation and Research Hospital Van, Turkey
[2]University of Inonu, Faculty of Medicine, Department of Emergency Medicine, Malatya, Turkey
[3]University of Inonu, Faculty of Medicine, Department of Cardiovasculer surgery Medicine, Malatya, Turkey
[4]Educuation and Research Hospital, Adıyaman Turkey
[5]Educuation and Research Hospital, Malatya, Turkey
[6]Educuation and Research Hospital Sivas, Turkey

Abstract

Background: The aortic dissection is a cardiovascular emergency with a high mortality rate which needs emergent rapid diagnosis and treatment. The patients admitted to ED who have been diagnosed as aortic dissection discussed in this retrospective study aiming demonstration of demographic features.

Material and Methods: Between August 2010 - August 2015 about 40 patients who admitted to Inonu university hospital ED have been diagnosed as aortic dissection discussed in this retrospective study. Patients files evaluated; the age, sex, past medical history, chief complaints, the duration between onset of complaint and admission to ED, blood pressure and other vital signs, echocardiographic changes, and whether there was aortic insufficiency or not were evaluated

Results: All patients' chief complaint was chest pain. About 75% of patients were admitted to emergency department within first 24 hour of onset of chest pain De Bakey type1, type 2 and type 3 were discussed as 70 %, 22.5%, and 7.5% respectively. 20% patients were hypertensive and 17.5% were hypotensive. 35% of patient's blood urea level were elevated. 95% of all these patients' undergone surgical operation, and reminder 5% patients medically followed up. At the end 82.5% of patients discharged with a full recovery while 17.5% died.

Conclusions: Aortic dissection is highly mortal cardiovascular emergency in our country which requires rapid diagnosis and evaluation by ED physician in order to decide the appropriate treatment options without time loss.

Keywords: Emergency Department, Aortic Dissection, Diagnosis, Mortality

Introduction

The aortic dissection is defined as separation of lamina media along the long axis from lamina intima of the aorta. It is with a high mortality rate cardiovascular emergency which needs emergent, rapid diagnosis and management[1]. The incidence is about 5.2/1million. 1-2% is determined at coronary autopsies. Although all age groups can be affected it's mainly seen between ages 40-70 in about 75% it is 3 folds more common in males than females[2]. Despite of the aortic dissection is rarely seen condition a missed or delayed diagnosis or management increases the rate of mortality and morbidity. The mortality rate despite of accurate management is about 10%[3].

There is no single well-known cause of aortic dissection, many etiologic factors like hypertension, connective tissue diseases, medial degeneration medial necrosis, atherosclerosis, aortic coarctation, past history of aortic surgery, iatrogenic, and traumatic factors have been determined[4].

Patients mostly presented with sudden tearing like chest pain. They also may present with syncope, neurological symptoms like hemiplegia, paraplegia and myocardial infarction, renal colic, dysphagia symptoms[5].

Aortic dissection diagnostic methods are computed tomography (CT) scan, echocardiography, magnetic resonance imaging (MRI) or aortography. The gold Standard of diagnosis remains the wide clinical suspicion of aorta dissection.

Corresponding Author: Hakan Oğuztürk **e-mail:** oguzturk@hotmail.com
Received: 29.12.2018 • **Accepted:** 21.02.2019

In our research patients admitted to emergency department (ED) with aortic dissection studied retrospectively for demographic characteristics demonstration.

Material and Methods

This study was approved by Inonu University ethics committee. Forty patients who admitted to ED of Inonu University hospital between August 2010- August 2015 and have been diagnosed with aortic dissection were discussed in this retrospective study. Patients files evaluated; the age, sex, past medical history, chief complaints, the duration between onset of complaint and admission to ED, blood pressure and other vital signs, echocardiographic changes and whether there were aortic insufficiency or not.

Dissection types classified as De Bakey type 1, type 2 and type 3. Type1 dissection which involves the whole aorta, type 2 which affecting only the ascending aorta and type 3 which affecting only descending aorta. CT scan done for all patients and radio-opaque material given during the procedure for best evaluation of dissection and its localization. After the confirmation of diagnosis the cardiovascular surgery consultation has been asked and the patients, their relatives have been informed about the problem and its prognosis. After the relative's approval some of patients directly from ED sent to operation room while others admitted to cardiovascular intensive care unit where they prepared for surgical operation.

After appropriate surgical management patients who discharged and those who died within hospital have been recorded.

SPSS 17.7 programed has been used for statistical analysis. Quantitative average data's, standard deviations, qualitative data's measured as frequency and percentage.

Results

Between August 2010 - August 2015, 14 females and 26 males of a total 40 patients evaluated in this study. Average age was 58±20. 33 of patients (82.5%) had medical history of coronary artery disease (CAD), 9 patients (72.5%) were with history of diabetes mellitus (DM),

All patients' chief complaint were chest pain. About 30 of (75%) patients were admitted to ED within first 24 hour of onset of chest pain. 4 of them (10%) presented with onset of pain 24-48 h duration and the reminder of patients 6 (15%) presented with onset of pain longer than 48 h duration. Concerning the echocardiographic findings in 23 (57.5%) patients there was flep appearance while 17 (42.5%) patients echocardiographic findings were completely normal. Regarding the aortic insufficiency in echocardiography in 27 patients (67.5%) there was severe aortic insufficiency and in 13 (32.5%) patient's echocardiography was normal. In 28 (70%) patients De Bakey type 1, in 9 (22.5%) patients De Bakey type 2, and in 3 7.5(%) patients De Bakey type 3 dissection was present.

Regarding the blood pressure evaluation 7 (17.5%) patients were hypotensive (<120/80), 25 (62.5%) patients were normotensive (>120/80, <180/110) and 8 (20%) patients were hypertensive (>180/110). According the blood urea level estimation results was; 26 (65%) patients' BUN<28mg/dl, 14 (35%) patients' BUN>28mg/dl. Among these 40 patients with dissecting aortic aneurysm 38 (95%) patients, surgical operation decided for them and approval received. Only 2 (5%) patients followed up without any surgical intervention. 33 (82.5%) of them after appropriate treatment discharged with complete recovery while 7 (17.5%) patients died. Clinical and demographic data's shown in table below;

Table 1. Patients' clinical &demographic data (CAD: Coronary artery disease, DM: Diabetes mellitus).

Patients characteristics		No	Percentage
Sex	Male	26	65
	Female	14	35
History	CAD	33	82.5
	DM	29	72.5
Chief complaint	Chest pain	40	100
Duration of symptoms	First 24 h	30	75
	24-48 h	4	10
	More than 48 h	6	15
Echocardiographic findings	Flep	23	57.5
	Aortic insufficiency	27	67.5
De Bakey classes	Type1	28	70
	Type2	9	22.5
	Type3	3	7.5
Blood pressure	Hypotensive	7	17.5
	Normotensive	25	62.5
	Hypertensive	8	20
BUN levels	Upper 28 mg/dl	14	35
	Under 28 mg/dl	26	65
Type of treatment	Surgery	38	95
	Medical treatment	2	5
Result	discharge	33	85.5
	Ex	7	17.5

Discussion

At the present time physician's wide clinical suspicion and improved facilities in diagnostic methods making diagnosis of aortic dissection easier than past. Aortic dissection main-

ly seen in hypertensive patients after age of 40. The hypertension is believed to be the main risk factor in etiology. Aortic dissection is 2-3 times more prevalent in males than females[6]. In our study 65% of patients was male and 35% was female, and the male/female ratio was 2. The mean age of patients was 58 and 20% above forty years had hypertension in these patients and these data are consistent with the literature. In one of studies among the patients diagnosed with aortic dissection about 15.9% of them were with DM history and 76% of them were with CAD history[7]. While in our study 82.5% of patients were with CAD and 72.5% were with DM history. Therefore patients with DM history were more in our study than other studies.

The most common symptom of aortic dissection is the sudden onset of chest and back pain which is predatory in character. Mainly the pain starting in anterior chest then radiating along dissecting aorta. Patients may also presented with neck ache or interscapular pain. Other than that, patients may presented with atypical symptoms such as; syncope, hypertension, hemiparesis, dysphasia or leg pain[8, 9]. In our study, nearly all of patients' presentation was the most common symptom of dissecting aneurysm, the chest pain.

Echocardiography is the noninvasive test which should be done in those patients. According to anatomical localization of the pathology, this diagnostic method's sensitivity is nearly 35-80% and specificity is about 39-96%[10]. Beside it shows left ventricular function, it gives idea about aortic insufficiency, aortic flap, and presence of thrombus, pericardial effusion or any ventricular wall abnormalities. Detection of flap support the diagnosis of Type 1 and Type 2 disease, but the absence of it does not exclude the diagnosis. It's important to determine whether there is involvement of the aortic valve and if there is insufficiency of valve present or not. This is mainly needed for planning of treatment and to final decision of aortic valve replacement[11]. In echocardiography done in Açıkalın and et al study[12] in 36.4% of patients there was flap appearance, while in our study this rate was 23 patients (57.5%). In the study done by Borst HG and et al[13] among the patients diagnosed with aortic dissection aortic insufficiency was found in 50% while in our study this ratio was 27 patients (67.5%). The ratio was higher than study done by Borst HG and et al.

In a study there was 6.2% of patients with an elevated blood urea levels[7], while in our study this ratio was 35%. In our study the ratio of patients with high blood urea level was higher than other studies in literature. The cause of this elevated ratio thought to be resulting from renal arteries involvement with aortic dissection[14].

In studies De Bakey Type 1 most often detected, it is followed by dissection Type 3 and Type 2. In a study done by Buket and et al[15], among 14 patients with aortic dissection 13 of them have been diagnosed with type 1 dissection. In our study also there was the same result. The most common type seen in our study was type 1 then followed by type 3 and at least type 2 according De Bakey classification.

In study done by Yeşilaras and et al[16] 89.4% of patients have been admitted, 2.1% died at ED and 8.5% referred to another health center.

The management of type 1 and type 2 dissections is surgical[17]. Acute type 3 dissections with exception of complicated cases can be treated medically or surgically no difference[18]. In our study 38 (95%) of patients managed surgically. In Acute Type 3 dissection in absence of reasons like mesenteric or renal ischemia, extremities ischemia, rupture risk etc. medical treatment should be preferred, because medical management is superior to surgical treatment at an early stage[19]. In about 2 (5%) of patients medical management and follow up preferred and discharged.

Regarding the surgical treatment of Type 1 and Type 2 aortic dissection, technique is difficult has a high mortality[20]. In our study the 7 (17.5%) of the patients who undergo surgical operation have been died in postoperative period. 33 (82.5%) of them discharged with full recovery.

The mortality of acute aortic dissection in an hour is l-3%[21]). Therefore, early admission to emergency room and early management is very important. In our study 75% of patients were admitted to emergency department within first 24 hour of onset of chest pain, 10% within 24-48 h, and 15% after 48 h. Among the patients who died at postop period; 2 of them were within first 24 h, other 2 of them were within 48 h and 3 of them were after 48 h admitted to ED.

Conclusion

Aortic dissection is highly mortal cardiovascular emergency in our country which requires rapid diagnosis and evaluation by ED physicians in order to decide the appropriate treatment options without time loss.

References

1. Mukherjee D, Eagle KA. Aortic dissection-an update. Curr Probl Cardiol 2005; 30: 287-325.
2. Coady MA, Rizzo JA, Elefteriades JA. Pathologic variants of thoracic aorta dissection: penetrating atherosclerotic ulcers and intramural hematomas. Cardiol Clin 1999; 17: 637-57.
3. Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, et al. The international registry of acute aortic dissection (IRAD): new insights into an old disease. JAMA 2000; 283: 897-903.
4. Svensson LG, Crawford ES. Aortic dissection and aortic aneurysm surgery: clinical observations, experimental investigations, and statistical analyses. Part II. Curr Probl Surg 1992; 29: 915-1057.
5. Cebicci H, Salt O, Gurbuz S, Sahin T, Cumaoglu M.O, Koyuncu S. Atypical presentations of aortic dissections: A case series. Acta Medica Mediterranea, 2014; 30: 85-90.

6. De Bakey ME, McCollum CH, Crawford ES, Morris GC Jr, Howell J, Noon GP, et al. Dissection and dissecting aneurysms of the aorta: twenty year follow-up of five hundred twenty seven patients treated surgically. Surgery 1982; 92: 1118-34.
7. Neri E, Toscano T, Papalia U, Frati G, Massetti M, Capannini G, et al. Proximal aortic dissection with coronary malperfusion: presentation, management and outcome. J Thorac Cardiovasc Surg. 2001; 121: 552-60.
8. Korkut S, Çıkman M, Kandiş H, Karapolat S, Güneş H. Acil serviste ayak ağrısının nadir bir sebebi: Aort diseksiyon olgusu. Konuralp Tıp Dergisi 2010; 2: 22-4.
9. Akgün FS, Turtay MG, Dişli OM, Oğuztürk H, Doğan M. Bacak ağrısıyla karakterize akut aort diseksiyonu. Genel Tıp Derg 2011; 21(4): 155-157.
10. Erbel R, Engberding R, Daniel W, Roelandt J, Visser C, Rennollet H. Echocardiography in diagnosis of aortic dissection. Lancet 1989; 1: 457-61.
11. Nienaber CA, von Kodolitsch Y. Disease of the aorta. Cardiol Clin 1998; 16: 295-314.
12. Açıkalın A, Satar S, Akpınar O, Kuvandık G, Sarı A, Kanadaşı M, et al. Aort diseksiyonu: Bir üniversite hastanesi acil servisine başvuran hastalarda iki yıllık klinik deneyim. Türkiye Acil Tıp Dergisi 2005; 5: 32-5.
13. Borst HG, Heinemann MK, Stone CD. Alternative procedures. In: Borst HG, Heinemann MK, Stone CD, Eds. Surgical treatment of aortic dissection. New York: Churchill Livingston; 1996: 285-93.
14. Kıykım AA. Akut böbrek yetmezliği nedenlerine genel bakış. Türk Nefroloji Diyaliz ve Transplantasyon Dergisi 2006; 15 (Supplement 1): 5-12.
15. Buket S, Apaydın A, Hamulu A, Özbaran M, Aşkar F, Sakarya M. Akut aort diseksiyonlarında cerrahi tedavi. GKD Cer Derg 1995; 3: 147-52.
16. Yeşilaras M, Sönmez N, Karcıoğlu Ö, Topaçoğlu H, Aksakallı S, Bayram B. Acil serviste aort diseksiyonu tanısı almış olan hastaların klinik özelliklerinin tanımlanması: Olgu serisi. Türkiye Acil Tıp Dergisi 2006; 6: 1-6.
17. Minale C, Splittgerber FH, Reifschneider HJ. Replacement of the entire thoracic aorta in a single stage. Ann Thorac Surg 1994; 57: 850-5.
18. Miller DC. The continuing dilemma concerning medical versus surgical management of patients with acute type B dissections. Seminars in Thoracic and Cardiovascular Surgery1993; 5: 33-46.
19. Buket S, Yağdı T, Hamulu A, et al. Distal dejeneratif aort anevrizmalarına cerrahi. In: Buket S, Yağdı T, editörler. Aort Cerrahisi. İstanbul: Yüce Reklam Dağıtım; 2003: 306-346.
20. Ikonomidis JS, Weisel RD, Mouradian MS, Ivanov J, Baird RJ, Mickleborough LL, et al. Thoracic aortic surgery. Circulation 1991; 84: 1-6.
21. Anagnostopoulos CE, Prabhakar MJ, Kittle CF. Aortic dissections and dissecting aneurysms. Am J Cardiol, 1972; 30(3): 263-73.

Case Report
Eurasian Journal of Critical Care

A Rare Cause of Spontaneous Pneumomediastinum: High Altitude

Utku Murat Kalafat, Serkan Doğan, Ramiz Yazıcı, Bensu Bulut, Duygu Yaman, Başar Cander
Kanuni Sultan Suleyman Education and Research Hospital, Department of Emergency Medicine, Istanbul, Turkey

Abstract

Introduction: Spontaneous pneumomediastinum (SP) is defined as presence of air within the mediastinum. SP is a rare, mild and self-limiting condition in young males. The etiology includes sudden increase in alveolar pressure, pulmonary diseases, labor, inhalation of toxic agents and high altitude rarely.

Case Report: A 30-year old male patient who were in a high-altitude province 10 days ago admitted to emergency room caused by dyspnea. Physical examination was normal. The complaint of dyspnea continued, computerized thorax tomography (CTT) was taken for diagnosis. In the CTT, air densities were observed in the posterior mediastinum. The patient was admitted to the thoracic surgery service with the diagnosis of spontaneous pneumomediastinum.

Conclusion: SP is a self-limiting clinical condition which responds to conservative therapy well. However, the diagnosis is difficult and it is necessary to keep in mind the diagnosis with anamnesis and physical examination.

Key words: Spontaneous pneumomediastinum, high altitude, dyspnea, emergency department

İntroduction

Spontaneous pneumomediastinum is defined as existence of intersititial air within the mediastinum[1, 2]. SP is a self-limiting disease with a well prognosis detected in young male adults[3]. Macklin reported that clinical presentation of SP appears as a result of rupture of the terminal alveoli due to increased intraalveolar pressure[1, 4]. Incidence of SP was reported as 1 case per 30,000 referrals to ER[2]. The patients with SP usually present dyspnea as well as findings with subcutaneous emphysema[5]. This condition may be diagnosed correctly almost in 100% of the cases through medical history, physical examination and radiological scans[3]. Since SP may potentially cause life threatening clinical presentations, early diagnosis should be established and treatment should be planned[3]. In the present article, we wanted to discuss early diagnosis and treatment process of a patient who referred because of dyspnea with an only significant history of staying in a high altitude province 10 days ago diagnosed with SP.

Case Report

A 30-year old male patient referred our emergency department due to dyspnea. The medical history revealed no concomitant disease or additional condition; however, it was expressed that the patient were in a high-altitude province 10 days ago. The patient was conscious with a well overall condition. Vital signs were as follows; blood pressure:120/90mmHg, pulse: 80pulse/min, respiration count: 22breaths/min; $Sp0_2$:%97 body temperature:36.6°C. Cardiac and respiratory sounds were normal in physical examination. Hamman's sign (the crackling sound heard simultaneously with peak heart rate) we not detected on the anterior surface of the chest by auscultation. The patient was taken under observation and monitorized. O_2 therapy by 2 l/min was started. Laboratory analyses revealed the following; CRP:46.10(<5mg/L) and no other pathological result was obtained. Arterial blood gas analysis was within physiological limits as pH:7,40 pCO2:34 pO2:89 HCO3:24. The electrocardiogram (ECG) was assessed as normal sinus rhythm. There was not any pathology in the lung x-ray. Since the complaint of dyspnea continued, computerized thorax tomography (CTT) was taken for diagnosis. In the CTT, air densities were observed in the posterior mediastinum (Image 1, 2). The images were evaluated by a thoracic surgeon; antibiotherapy was started and the patient was hospitalized for monitoring and treatment. The patient presented a clinical relief and was discharged on the second day of admission.

Corresponding Author: Ramiz Yazıcı **e-mail:** dr.ramiz.yazici@gmail.com
Received: 31.12.2018 • **Accepted:** 31.12.2018

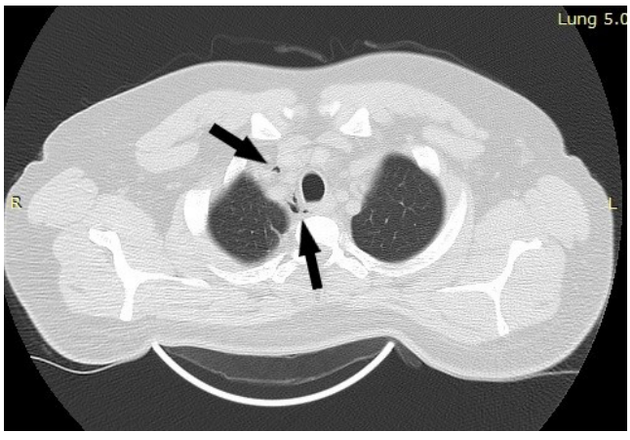


Image 1. Free air in apical CTT slices

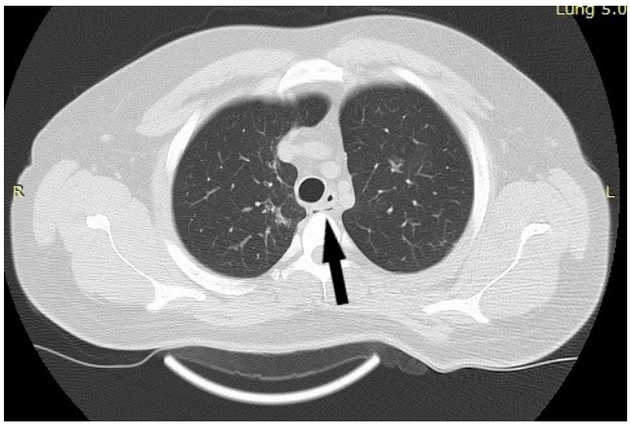


Image 2. Free air detected on the middle zones in CTT

Discussion

The case whom we presented did not have any predisposing factor or concomitant disease except high altitude which may cause SP. A level of 1,500 meters and over from the sea level is accepted as high altitude. High altitude may cause some cardinal symptoms such as nausea, cough, dyspnea as well as significant conditions such as acute mountain disease, high altitude cerebral edema, high altitude pulmonary edema[14]. SP appears as a result of rupture of the terminal alveoli due to intraalveolar pressure in the conditions that cause increase in alveolar pressure such as coughing, vomiting, straining and valsalva maneuver. Predisposing diseases include pulmonary diseases (asthma, chronic obstructive pulmonary disease, diffuse interstitial fibrosis, malignancies of the lung, cystic lung diseases), diabetic ketoacidosis, heavy exercise, inhalation or smoking marijuana, cocaine, extacy, infections of the upper respiratory tract[6-9]. The patient had not any previous disease and there was not any chronic pulmonary disease detected in the analyses performed in ER. Some metabolic and toxic diseases, inhalable toxic agents, barotrauma during mechanic ventilation, hyperbaric treatment, ascending phase of diving, high altitude may exist as a cause[6-13]. The only significant history in our patient was a short trip to a high altitude province.

In the study of Koulias et al. performed on 24 cases; pulmonary disease (acute bronchial asthma, idiopathic pulmonary fibrosis and severe cough) was detected in 8 (%33.2) patients; 6 (%25) patents presented use of illegal drugs (cocaine and heroine); heavy physical activity (tennis, halter, football and wrestling) was detected in 6 (%24.9) patients whereas 2 (%8.3) patients presented severe vomiting attacks. There was not any other predisposing factor in other 2 (%8.3) patients[8]. Panacek et al. performed a SP study on 17 cases and detected 13 (%76) cases associated with inhalation and use of illegal drugs[9]. Drug use is considered as the most important triggering factor for SP among young population all over the world. Our patients was investigated in terms of illegal drug use and it was learned that he did not use. We did not detect any predisposing factor during the examination of the patient. We believe that the patient had SP due to high altitude.

The most common signs and findings in SP are chest pain, dyspnea and subcutaneous emphysema[5]. The most common symptoms in SP were dyspne (%85), swelling in neck (%69), chest pain (%69) and cough (%54), and determined subcutaneous emphysema in %85 of them according to the study of Panigrahi and colleagues[11]. Typical physical examination finding is Hamman's sign[4]. Panacek et al. detected the Hamman's sign in %52 of the patients in their SP series including 17 cases[9]. We could not detect the Hamman's sign; dyspnea was the only symptom.

Posterior-Anterior lung x-ray and CTT are sufficient for diagnosis of these cases[6]. Kaneki et al. detected that %30 of the cases presented normal chest x-ray whereas the remaining cases were diagnosed by chest tomography[12]. CTT is accepted as a gold standard for diagnosis of SP[2]. There was not any pathology detected in the PA lung x-ray of the patient. We established the final diagnosis through CTT which is the gold standard test in the literature.

SP reponds very well to the conservative treatment[3]. SP treatment includes a careful observation, bedrest, oxygen inhalation, analgesic and antibiotic treatments[8]. In the SP study of Kim et al. conducted on 64 patients, oxygen inhalation therapy and bedrest were performed to all patients (%100); 57 (%89.1) patients received prophylactic antibiotherapy and 47 (%73.4) patients received analgesic drugs; no mortality and morbidity was detected in the cases[1]. We also implemented oxygen therapy, bedrest and prophylactic antibiotherapy for our patient.

Conclusion

Consequently, SP is a self-limiting clinical condition which responds to conservative therapy well. However, due to potential life threatening risk, a detailed medical history tak-

ing, physical examination as well as appropriate imaging methods should be used for rapid diagnosis and treatment planning.

References

1. Kim KS, Jeon HW, Moon Y, Kim YD, Ahn MI, Park JK, Jo KH. Clinical experience of spontaneous pneumomediastinum: Diagnosis and treatment. J Thorac Dis. 2015; 7(10): 1817-24.
2. Newcomb AE, Clarke CP. Spontaneous pneumomediastinum: A benign curiosity or a significant problem? Chest. 2005; 128: 3298-302.
3. Cevik Y, Akman C, Sahin H, Altinbilek E, Balkan E. Spontaneous Pneumomediastinum: Two Cases. Eurasian J Emerg Med. 2009; 8: 60-2.
4. Akdemir HU, Turkoz B, Kati C, Duran L, Kayhan S, Caliskan F. Spontaneous Pneumomediastinum: Coexistence of Shortness of Breath and Hoarseness: Case Report. JCAM. 2013; 4: 229-31.
5. Ryoo JY. Clinical analysis of spontaneous pneumomediastinum. Tuberc Respir Dis (Seoul). 2012; 73(3): 169-73.
6. Adadioglu I, Yavuz Y, Solak O, Yurumez Y, Esme H. Primary Spontaneous Pneumomediastinum: Case Report. JEMCR. 2010; 1: 37-40.
7. Iyer VN, Joshi AY, Ryu JH. Spontaneous pneumomediastinum: analysis of 62 consecutive adult patients. Mayo Clin Proc. 2009; 84(5): 417-21.
8. Koullias GJ, Korkolis DP, Wang XJ, Hammond GL. Current assessment and management of spontaneous pneumomediastinum: experience in 24 adult patients. Eur J Cardiothorac Surg 2004; 25(5): 852-5.
9. Panacek EA, Singer AJ, Sherman BW, Prescott A, Rutherford WF. Spontaneous pneumomediastinum: clinical and natural history. Ann Emerg Med. 1992; 21(10): 1222-7.
10. Khurram D, Patel B, Farra MW. Hamman's Syndrome: A Rare Cause of Chest Pain in a Postpartum Patient. Case Rep Pulmonol. 2015; 2015: 201051.
11. Panigrahi MK, Suresh Kumar C, Jaganathan V, Vinod Kumar S. Spontaneous pneumomediastinum: Experience in 13 adult patients. Asian Cardiovasc Thorac Ann. 2015; 23(9): 1050-5.
12. Kaneki T, Kubo K, Kawashima A, Koizumi T, Sekiguchi M, Sone S. Spontaneous pneumomediastinum in 33 patients: yield of chest computed tomography for the diagnosis of the mild type Respiration. 2000; 67(4): 408-11.
13. Morgan J, Sadler MA, Yeghiayan P. Emerg Radiol. 2007; 14: 457.
14. Harris MD, Terrio J, Miser WF, Yetter JF 3rd. High-altitude medicine. Am Fam Physician. 1998; 57(8): 1907-14, 1924-6.

Case Series
Eurasian Journal of Critical Care

Aortic Dissection in Different Clinical Findings : Case Series

Muhammed Ekmekyapar[1], Hakan Oğuztürk[2], Tuba Ekmekyapar[3], Serdar Derya[1], Şükrü Gürbüz[2], M. Gökhan Turtay
[1]Emergency Medicine Department, Malatya Education and Research Hospital, Malatya,Turkey
[2]Emergency Medicine Department, Faculty of Medicine, Inonu University, Malatya, Turkey
[3]Neurology Department, Malatya Education and Research Hospital, Malatya, Turkey

Abstract

Aortic dissection occurs as a result of the rupture of the internal wall of the aorta, and it is an emergency. We aimed to present 5 cases diagnosed with Aortic dissection that visited us with typical/atypical symptoms which have very high mortality rates in cases where the diagnosis is not made. The ages of the patients who were all male were in the range of 49-66. Two patients were brought due to complaints of chest pain, two were brought for syncope and one was brought for abdominal pain. Additionally, there was a clinical case of stroke in one of the patients who was brought for chest pain. All the patients were hospitalized in the department of CVS for their monitoring and treatment. Our provisional diagnosis must definitely consider acute Aortic dissection which has a high mortality rate especially when patients with uncontrolled or newly diagnosed hypertension visit emergency services with complaints of severe chest, back and/or abdominal pain, and when there is an incidence of atypical syncope or stroke.

Keywords: Aortic dissection, stroke, abdominal pain, syncope

Introduction

Both acute Aortic dissection and ruptured aorta aneurysm are prominent causes of death in cardiovascular diseases. This situation, which threatens life, was recently classified as an acute aortic syndrome. Acute aortic syndromes are defined as an emergency in the clinic and they may be listed as Aortic dissection, intramural hematoma without intimal rupture, penetrant atherosclerotic ulcer and ruptured or almost ruptured an aorta aneurysm[1]. We aimed to present cases diagnosed with Aortic dissection that visited us with typical/atypical symptoms which have very high mortality rates in cases where diagnosis is not made.

Cases

Case-1

The male patient who was at the age of 49 visited the emergency services with the complaint of abdominal pain. There was no history in the part of the patient. The patient had complaints of abdominal pain and no additional complaints. In the physical examination of the patient, the abdomen was aching and sensitive, and there was no defense or rebound. The peripheral pulse of the patient was clear. The vital parameters of the patient were as temperature: 36 °C, heart rate 76/min, BP: 125/80 mmHg, respiratory rate 21/min. The hemogram measurements of the patient were normal, biochemical values showed creatinine as 1.4 mg/dL (normal range 0.72-1.25), alanine aminotransferase as 105 U/L (normal range <55), aspartate aminotransferase as 55 (normal range 5-34) and lactate dehydrogenase as 263 U/L (normal range 125–243), while the other biochemical parameters were normal. There was normal sinus rhythm in the ECG of the patient and the troponin value was negative. As a result of the physical examination, the radiological tests of the patient were requested. There was no sign in the lung radiography and standing direct abdomen radiography of the patient. The abdominal ultrasonography of the patient was reported as "abdominal aorta lumen diameter increased, and the manifestation is in agreement with the echogenic flap that pulsates in the lumen (dissection?)." After this, dynamic thorax-abdomen tomography was requested for the patient, and we observed a manifestation that was in agreement with dissection that started with the middle level of the aortic arch and extended through the thoracic aorta, abdominal aorta, both main iliac arteries and external iliac arteries (DeBakey Type-3, Stanford Type B) (Figure-1). Cardiovascular surgery consultation was requested for the patient and the patient was hospitalized at the cardiovascular surgery intensive care unit.

Corresponding Author: Hakan Oğuztürk **e-mail:** drcitirik@hotmail.com
Received: 01.01.2019 • **Accepted:** 05.03.2019

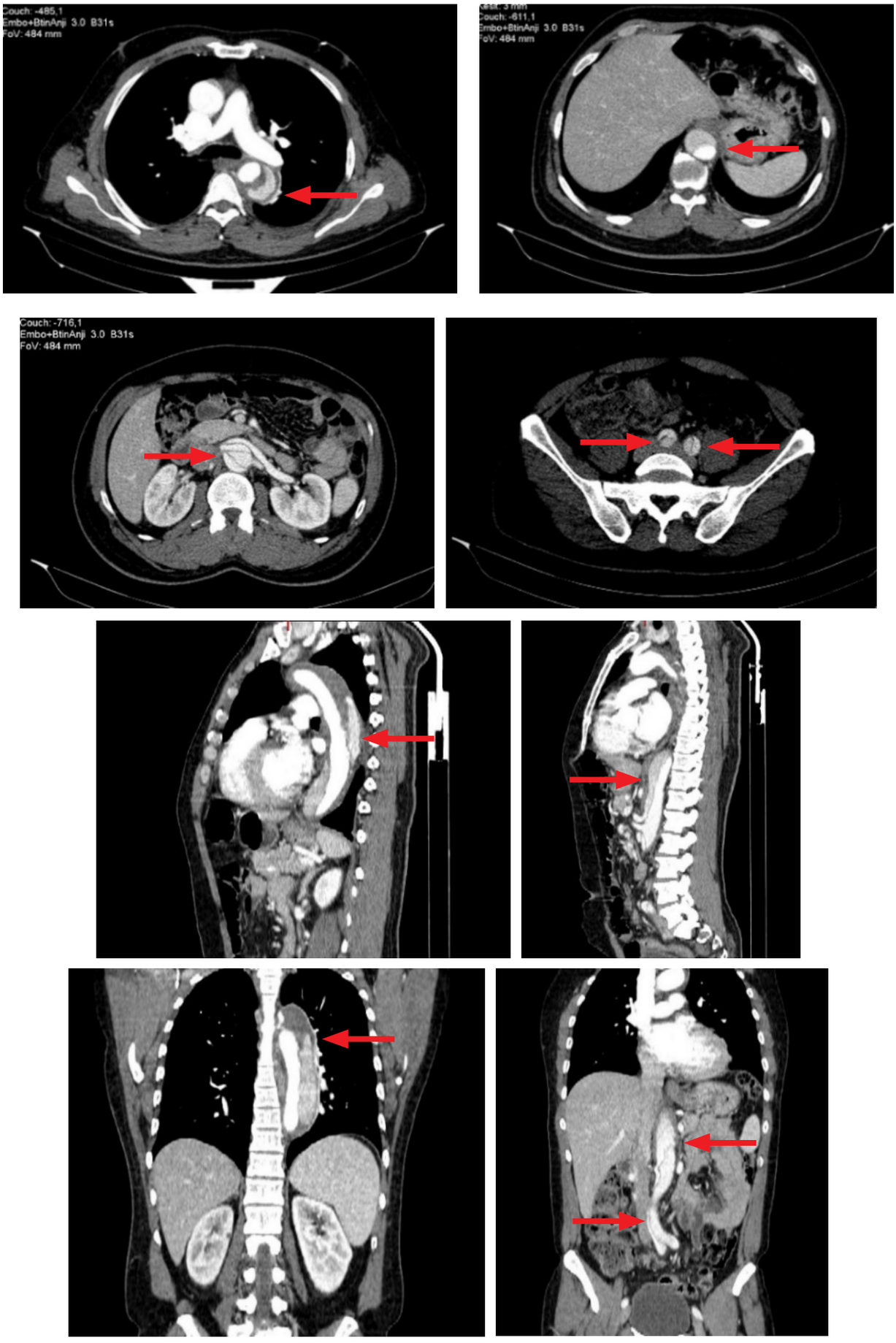


Figure 1. The manifestation of the patient that is compliant with Aortic dissection in his 3D dynamic thorax-abdomen CT

Case-2

The male patient who was at the age of 66 visited an external center's emergency services with syncope. The patient was examined at the external center and diagnosed with Aortic dissection. While correspondence was going on about transferring him from the external center to our center, the patient was inappropriately directed to us as an outpatient. As a result of the anamnesis received from the patient and his relatives, it was confirmed that he visited the external center as a result of syncope. The patient had a history of hypertension. There was no sign in the physical examination of the patient. The vital parameters of the patient were as, temperature 36.5°C, heart rate: 118/min, BP: 169/92 mmHg, respiratory rate: 22/min. The hemogram and biochemistry values of the patient in his blood tests were normal, while the d-dimer value was 11.54 mg/L (normal range: 0-0.55).

The patient's ECG sinus tachycardia and troponin value were negative. The external center had taken the dynamic thorax + abdomen CT scan of the patient, the scan's CD was brought by the relatives of the patient to the emergency services after he arrived. The CT of the patient was examined, and there was a manifestation that was in compliance with dissection in the ascending aorta and the aortic arch (DeBakey Type-2, Stanford Type A) (Figure-2). Cardiovascular surgery consultation was requested for the patient. The patient was given echocardiography and the observed manifestation was in compliance with a dissection flap in the ascending aorta (Figure-3). The patient was hospitalized at the cardiovascular surgery intensive care unit to be taken into surgery.

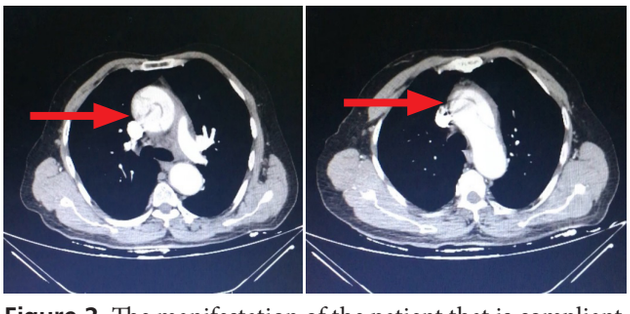


Figure 2. The manifestation of the patient that is compliant with aortic arch dissection in his dynamic thorax-abdomen CT

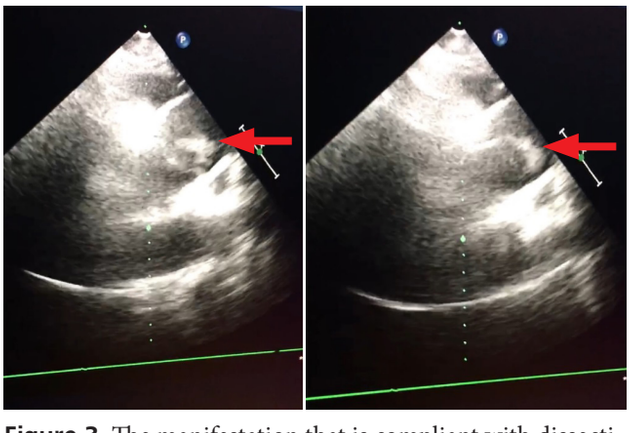


Figure 3. The manifestation that is compliant with dissection flap at the ascending aorta in the echocardiography

Case-3

The 55-year-old male patient visited the emergency services with complaints of chest pain that started 2 hours ago, as well as numbing and loss of strength in the left side of the body. The patient had a history of hypertension. In the physical examination of the patient, the muscle strength in the left side of the body was 4/5. Other system examinations provided normal results. The vital parameters of the patient were as, temperature: 36°C, heart rate: 60/min, BP: 85/40 mmHg, respiratory rate 24/min. The patient's ECG was normal sinus rhythm and troponin negative. The hemogram and biochemistry values of the patient in his blood tests were normal, while the d-dimer value was 17402 ng/ml (normal range: 0-230). As there was numbing in the left side of the patient's body, he was given unenhanced brain CT for intracranial pathology, which was followed by dynamic thorax + abdomen CT for Aortic dissection. There was no pathology of the patient's brain CT. The CT of the patient showed a manifestation that was in compliance with dissection in the descending and ascending aorta, and the aortic arch (DeBakey Type-1, Stanford Type A) (Figure-4). The patient was consulted with cardiovascular surgery and neurology. The patient, for whom neurology did not consider any pathology, was hospitalized at the cardiovascular surgery intensive care unit.

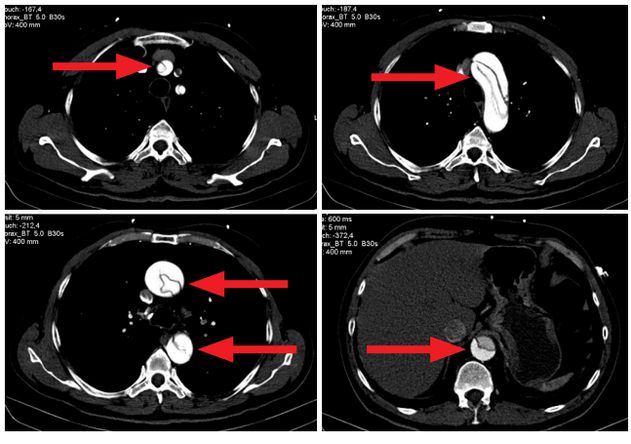


Figure 4. The manifestation of the patient that is compliant with ascending aorta, descending aorta and aortic arch dissection in his dynamic thorax-abdomen CT

Case-4

The 42-year-old male patent had crashed a wall with his car 10 minutes ago at location that is close to our emergency services, he was found unconscious in his car and directed to us. We took the patient to the emergency services. The patient had confusion and was in generally bad shape. A clear anamnesis was not possible. The vital parameters of the patient were as, temperature: 36 °C, heart rate: 38/min, BP: 114/74 mmHg, respiratory rate: 20/min. The ECG of the patient was in complete compliance with complete AV block and this troponin was negative. The hemogram and biochemistry values

Figure 5. The manifestation of the patient that is compliant with ascending aorta aneurysm and dissection in the ascending aorta and aortic arch in his dynamic thorax-abdomen CT

of the patient were normal. 1 mg atropine was administered to the patient with the complete AV block.

Echocardiography was applied to the patient and a manifestation was observed in compliance with a 6.4 cm of aneurysm in the ascending aorta, and a dissection flap in the ascending aorta. Unenhanced brain CT and dynamic thorax-abdomen CT were taken. The brain CT of the patient was normal. The CT of the patient showed a manifestation that was in compliance with aneurysm in the ascending aorta, and dissection in the ascending aorta and the aortic arch (DeBakey Type-2, Stanford Type A) (Figure-5). Consultation was requested for the patient from neurology for syncope and cardiovascular surgery for acute Aortic dissection. The patient was hospitalized at the cardiovascular surgery intensive care unit.

Case-5

The 62-year-old male patient visited the emergency services with complaints of chest pain. The patient had a history of thoracic aorta aneurysm. The vital parameters of the patient were as, temperature: 36°C, heart rate: 75/min, BP: 125/75 mmHg, respiratory rate: 18/min. The was no sign in the physical examination of the patient. The patient's ECG was normal sinus rhythm and troponin value was negative. The hemogram and biochemistry values of the patient were normal. The echocardiography of the patient revealed a manifestation that is in compliance with ascending aorta aneurysm and dissection flap starting from the ascending aorta. Dynamic thorax-abdomen CT was taken, and the manifestation was in compliance with ascending aorta aneurysm and dissection in the ascending aorta, aortic arch and descending aorta (DeBakey Type-1, Stanford Type A) (Figure-6). Cardiovascular surgery consultation was requested for the patient. He was hospitalized at the cardiovascular surgery intensive care unit.

Discussion

Dissections are caused by rupturing of the intima-medial entry which creates potential for distributing antegrade or retrograde blood flow. Acute Aortic dissection is defined as dissection that takes place 2 weeks after the beginning of pain[2]. Those that start in the 2nd to 6th week are called subacute, and those that occur later than 6 weeks are called chronic dissections[2]. Isolated dissection of the abdominal aorta is a rare case[3], and this is why the vast majority of dissections that include the abdominal aorta represent the progressing of dissection that occurs in the thoracic aorta. There are two classifications that are used the most frequently for dissection. The DeBakey classification was divided into three types (Type-1, 2 and 3) based on the starting point of dissection[4]. The Stanford classification has two types (Types A and B) based on the involvement of the ascending aorta[5]. The most frequent risk factor for Aortic dissection is uncontrolled hypertension (65-75% with history of hypertension)[1, 6]. Other risk factors include age, male sex, smoking, previous aortic diseases or aortic valve disease, direct blunt trauma, family history, history of cardiac surgery and usage of intravenous drugs (cocaine or amphetamines)[1, 2, 7]. The most typical symptom is the sudden start of severe chest or back pain. The pain may be sharp, and in the form of tearing or stabbing feelings, and typically different from other reasons for chest pain. Patients typically visit with complaints of

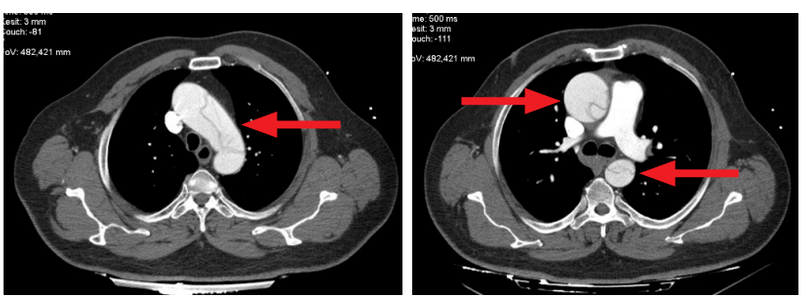


Figure 6. The manifestation of the patient that is compliant with ascending aorta aneurysm and dissection in the ascending aorta, aortic arch, and descending aorta in his dynamic thorax-abdomen CT

tearing chest and back pain, while they may visit with atypical clinical pictures we mentioned in our cases such as abdominal pain, syncope, stroke. Various complications may be seen in connection to dissection in other organs. Cardiac complications are seen most frequently in Type A dissections, while these are aorta deficiency, myocardial ischemia or infarction and tamponade. Sensory loss may also be seen in patients, and this is a neurological symptom which may extend from falling asleep to deep coma. The neurological state is based on the extent of reduction in blood flow due to brain cerebral circulatory disruption, hypotension or distal thromboembolism. Other than these, a different picture like mesenteric ischemia is seen in 5% of both Type A and Type B Aortic dissection patients[8]. As it is seen here, Aortic dissection may appear with highly variable clinical pictures.

Conclusion

An acute aortic syndrome which includes acute Aortic dissection and ruptured aorta aneurysm is one of the main causes of death in cardiovascular diseases. Our provisional diagnosis must definitely consider acute Aortic dissection which has a high mortality rate especially when patients with uncontrolled or newly diagnosed hypertension visit emergency services with complaints of severe chest, back and/or abdominal pain, and when there is an incidence of atypical syncope or stroke.

References

1. Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. ESC Committee for Practice Guidelines. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). Eur Heart J. 2014;35:2873–926.
2. Nienaber CA, Powell JT. Management of acute aortic syndromes. Eur Heart J. 2012;33:26–35b.
3. Trimarchi S, Tsai T, Eagle KA Acute abdominal aortic dissection: insight from the International Registry of Acute Aortic Dissection (IRAD). J Vasc Surg. 2007;46(5):913–919.
4. DeBakey ME, Henly WS, Cooley DA, Morris GC Jr, Crawford ES, Beall AC . Surgical management of dissecting aneurysms of the aorta. J Thorac Cardiovasc Surg. 1965;49:130–49.
5. Daily PO, Trueblood HW, Stinson EB, Wuerflein RD, Shumway NE. Management of acute aortic dissections. Ann Thorac Surg. 1970;10: 237–47.
6. Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA. 2000;283:897–903.
7. Tsai TT, Nienaber CA, Eagle KA. Acute aortic syndromes. Circulation. 2005;112:3802–13.
8. Di Eusanio M, Trimarchi S, Patel HJ, Hutchison S, Suzuki T, Peterson MD, et al. Clinical presentation, management, and short-term outcome of patients with type A acute dissection complicated by mesenteric malperfusion: observations from the International Registry of Acute Aortic Dissection. J Thorac Cardiovasc Surg. 2013;145:385–90.

Case Report
Eurasian Journal of Critical Care

Hereditary Angioedema and Allergic Reaction Due to Fresh Frozen Plasma

Serdar Derya, Şükrü Gürbüz, Muhammed Ekmekyapar, Hakan Oğuztürk, Muhammet Gökhan Turtay, Neslihan Yücel, Abdullah Keyfo Kama
Department of Emergency Medicine, Inonu University, Malatya, Turkey

Abstract

Hereditary angioedema (HA) is a rare disorder characterized by recurrent angioedema attacks and autosomal dominant transmission. Plasma C1 occurs due to esterase inhibitor deficiency. Angioedema is most commonly seen in the extremities, oropharynx, and visceral organs. Intestinal mucosal edema can cause temporary obstruction and severe abdominal pain that can interfere with acute abdomen. It should be kept in mind that antihistamines, stereoids, androgens, FFP (Fresh frozen plasma) and C1 esterase inhibitors used in the treatment of these patients may also develop allergies and these drugs should be used with caution. We aimed to present a 51 years old female patient (Figure-1) with a diagnosis of hereditary angioedema in our case which developed FFP (Fresh frozen plasma) allergy.

Key Words: Hereditary angioedema, FFP (Fresh frozen plasma), allergy

Introduction

Hereditary angioedema (HA) is a rare autosomal dominant disorder characterized by recurrent angioedema attacks. It is caused by the lack of plasma C1 esterase inhibitor. The disease that may begin in puberty, sometimes in childhood, is a condition characterized by subcutaneous and mucosal edema[1]. In patients with HA attacks, the concentrations of C4 and C2 decrease while the concentrations of C3 and C1 remain normal. Thus, there are also those who recommend C4 measurement as a screening test for hereditary angioedema[2]. C1, C2, C4 decrease chronically in case of the absence of this enzyme which functions in the complement system. Complement deficits become more apparent during attacks. We aimed to present a 51-year-old female patient who has a diagnosis of hereditary angioedema and developed FFP (fresh frozen plasma) allergy in our case.

Case report

A 51-year-old female patient with complaints of swelling and erythema on the face and neck applied to the emergency department. The patient has a history of HA. There was edema and erythema in the neck and face, no uvula edema. The patient ‘s vital parameters including blood pressure, pulse, respiratory rate and fever were respectively measured as 130/90 mmHg, 74 /min, 16/min and 36° C. In the laboratory tests of the patients, white blood cell (WBC), hemoglobin (HB), hematocrit (HCT) and platelets (PLT) from hemogram parameters were respectively 11,4 10^3/ml, 16,6 g/dl, 50,5% and 280 10^3/ml, glucose and C-reactive protein (CRP) from biochemical parameters were respectively 143 mg/dl and 0,48 mg/dl (normal range is 0 to 0,35) and the other parameters were normal. She had developed allergies to antihistamines and steroids during previous attacks. Patient with hereditary angioedema was consulted dermatology department. Dermatology suggested giving 2 units of FFP to the patient. We started giving FFP to the patient. The patient who received FFP treatment stated that she experienced a feeling like a lump in his throat, burning sensation on her face and difficulty in swallowing. FFP treatment was stopped immediately. It was seen that swelling and erythema in the face increased and uvula edema developed during the patient’s control examination (Figure 1). Then, 1000 IU (2 vials) of C1 esterase inhibitor was given to the patient. It was seen that the patient’s complaints and swelling of the uvula decreased. While FFP therapy is given to patient with hereditary angioedema, it should be absolutely considered that the patient may develop allergies to the FFP and the patient should be closely monitored with attention.

Corresponding Author: Şükrü Gürbüz **e-mail:** sukrugurbuz@gmail.com
Received: 17.01.2019 • **Accepted:** 21.02.2019

Figure 1. Increased redness and uvula edema after FFP treatment

Discussion

HA is a rare autosomal dominant disorder characterized by recurrent angioedema attacks. It is caused by the lack of plasma C1 esterase inhibitor. The disease that may begin in puberty, sometimes in childhood, is a condition characterized by subcutaneous and mucosal edema[1]. HA was first described by William Osler in 1888[3]. C1 INH is a functional or quantitative complement that regulates the initial proteins of the classical complement system. It Is a rare autosomal dominant (AD) disease characterized by the lack of the C1 complement inhibitor (C1 INH)[4-5]. 75% of the cases have family history and no gender difference similarly to the other AD diseases. HA is a disease characterized by attacks of edema which is well-circumscribed and non-pitting in the extremities, larynx, face and the body[5-6]. It is possible to confirm the diagnosis by detecting C1 INH levels. HA is usually self-limited and localized edema is prevalent due to the reversible increase in vascular permeability in its clinic. Patients have complaints such as subcutaneous edema, abdominal pain, nausea, vomiting, diarrhea, dysphagia and dysphonia. The most feared complication of hereditary angioedema is laryngeal edema. Laryngeal edema usually presents at older ages and occurs in less than 1% of attacks. Serum C4 levels are low during attacks and non-attack periods in nearly all cases with HA. C1 and C3 levels are normal. FFP may be useful for preoperative short-term prophylaxis and an acute attack. Researches on recombinant C1 INH, recombinant kallikrein inhibitor and bradykinin receptor antagonists continue. After the C1 esterase inhibitor administered to our patient, it was seen that the complaints of the patient and edema of the uvula were regressed.

Conclusion

As a result, patients with HA may visit the emergency services because of the complaints such as erythema, edema and shortness of breath. It should be kept in mind that allergies to antihistamines, steroids, androgens, FFP and C1 esterase inhibitors used in the treatment of these patients may develop and these drugs should be used with caution.

References

1. Huang YT, Lin YZ, Wu HL et al: Hereditary angioedema: a family study. Asian Pac J Allergy Immunol 2005;23:227-33.
2. Isselbacher KJ. Harrison's principles of internal medicine, 15th ed. McGraw-Hill, 2001
3. Osler W. Hereditary angio-neurotic oedema. Am J Med Sci 1888;95:362-7.
4. Frank MM. Hereditary angioedema: a half century of prog¬ress. J Allergy Clin Immunol 2004;114:626-8.
5. Witschi A, Krahenbühl L, Frei E, Saltzman J, Spath PJ, Müller UR. Colorectal intussusception: An unusual gastroin¬testinal complication of hereditary angioedema. Int Arch Allergy Immunol 1996;111:96-8.
6. Frank MM. Herditary angioedema: a half century of progress. J Allergy Clin Immunol 2004;114:626-8.

Research Article
Eurasian Journal of Critical Care

Evaluation of Patients Aged 65 and Over After Fall

Ayça Çalbay[1], Zeynep Çakır[2], Abdullah Osman Koçak[2]

[1]Department of Emergency Medicine, Universith of Health Science Erzurum Training and Research Hospital, Erzurum, Türkiye

[2]Department of Emergency Medicine, Atatürk University, Erzurum, Türkiye

Abstract

Objective: Patients aged 65 and older are less likely to be injured than youngers and older patients are more likely to have a fatal out come from their injuries. Physical reserves of the elderly patients were changing by the age. Injuries due to these changes adversely affect the outcome and prognosis of the geriatric patients. The main causes of injury in the geriatric population are falling, non-vehicle traffic accidents and burns. The most common causes of emergency services admitting are falls.

Method: Our study is a retrospective descriptive study. We investigate the 65 and over 65 years patients who were admitted to our emergency department with the complaint of fall from their own high on 01.12.2017 to 31.01.2018.

Result: Years of 65 and over of 98 patient were included to study. Patients were classified seven different injury areas as following: head, spinal (cervical-thoracal-lomber), thorax, abdomen, pelvic, upper extremity (shoulder, humerus, elbow, radius, ulna, hand) and lower extremity (femur, knee, tibia, fibula, foot). The most affected area of these groups as following in orderly: upper extremity (42), head (31), lower extremity (28), thorax (23), pelvis (20) and cervical spine (17).

Conclusion: Falls are the cause of %40 patients death in this age group. Minor mechanisms of injury can produce potentially lethal injury and complications. As with all trauma cases, the physical examination of the patients should be performed carefully in the geriatric group. In extremity traumas signs and complaints of geriatric patients should be the guide of lession.

Key words: Fall, geriatric trauma, upper extremity injury

Objective

According to the world health organization used for 65 years and older definition middle-aged and elderly. Due to data from the Turkey Statistics Institute (TUIK), 8.5% of people Turkish community constitutes over 65 years of age. This rate increases with the increasing quality of life and quality of service provided in the field of health every year, dissemination of methods used in screening of chronic and malignant diseases. The expansion of the elderly population in the community requires the improvement of specific preventive and therapeutic methods.

Due to human physiology, some changes occur with age progresses. The senses of hear, taste, smell weaken. Visual acuity decreases. Management of movement and reflexes worsens by joint degeneration, decreased tissue and body elasticity, deterioration of depth perception. These changes may be a cause of injury, as well as avoiding injury.

Chronic diseases and the drugs used for these are another important factors affecting elderly physiology. Antidiabetic drugs, blood thinners, antihypertensives and medications that slow down the heart rate may worsen the patient's prognoses and outcome[1]. They may delay or failed the compensation mechanisms due to trauma. They can mask the formation of tachycardia in hypovolemic shock which is one of the signs of seriousness of injuries and may cause major effects in minor traumas with their effects on bleeding diathesis[2-3].

The major causes of injury to the geriatric group are falling, non-vehicle traffic accidents and burns. The most common causes of emergency services admittion are falls[3-4]. The cause of trauma deaths in geriatric patients is 40% falls. Therefore, in our study, falls over 65 years were examined.

In the region we live, the months between December and January are the hardest times for the elderly patients by the physical conditions. Erzurum is on the east side of Türkiye. The coldest winter days and nights living between December to January months. Because of this situation we aimed to investigate the fall geriatric patients in this period and define their affected areas and seriousness.

Corresponding Author: Ayça Çalbay **e-mail:** (drycshn@gmail.com)
Received: 05.02.2019 • **Accepted:** 18.03.2019

Method

In this retrospective descriptive study, patients aged 65 years or older who were admitted to University of Health Science, Erzurum Training and Research Hospital Emergency Department due to fall were searched. Between 01.12.2017 and 31.01.2018, 101 patients who were admitted to our clinic were investigated. Three of these patients were excluded from the study because of the unindication of the affected area after the fall. Electronic files of 98 patients included in the study were scanned one by one. Anamnesis forms, x-ray radiographs, computed tomography and magnetic resonance images of the patients were examined and the affected areas were recorded.

Results

Years of 65 and over of 98 patient were included to study. Because of missing data three patient were excluded. Patients were classified seven different injury areas as following: head, spinal (cervical-thoracal-lomber), thorax, abdomen, pelvic, upper extremity (shoulder, humerus, elbow, radius, ulna, hand) and lower extremity (femur, knee, tibia, fibula, foot). The most affected area of these groups as following in orderly: upper extremity (42 patient), head (31 patient), lower extremity (28 patient), thorax (23 patient), pelvis (20 patient) and cervical spine (17 patient)(Table 1). 1/3 of upper extremity trauma and ¼ of lower extremity and pelvis traumas were resulted with fracture. There was not any mortal injury showed with C-spine, T-spine, knee and wirst traumas. Because of the using upper extremity with falling position and protecting reflex on trauma movement bone of radius and ulna were the most injured areas.

There was a fracture 20% of pelvic trauma group.

Table 1. Affected areas from the injury

Effected Area	Injury	Fracture (Compression-Spinal)	Dislocation (Hemoragy-Head, Contusion-Torax, transvers proces fracture-Spinal)
Head	31	1	1
Spinal-C	17	0	0
Spinal-T	9	0	1
Spinal-L	7	1	0
Torax	23	5	2
Abdomen	4	0	0
Pelvic	20	4	0
Shoulder	8	2	1
Humerus	4	2	0
Whirist	3	0	0
Radius	17	7	0
Ulna	17	3	1
Hand	8	0	0
Femur	12	4	0
Knee	11	0	0
Tibia	3	1	0
Fibula	3	1	0
Foot	2	1	0
Upper Extremity	42	15	2
Lower Extremity	28	7	0

Conclusion

Falls are the cause of %40 patients death in this middle-aged and elderly age group.

Visual, hearing, and memory impairments cause falls in older adults. In addition drugs, alcohol use, changes in the central nervous and musculoskeletal systems (degeneration of joints) effects them. Because of their physical changes like brain atrophy, decrease of respiratory vital capasity and cardiac stroke volume and rate with anticoagulant drug use the results of fall will be more mortal[5]. Minor mechanisms of injury can produce potentially lethal injury and complications.

In head traumas, patients' consciousness should not be depend on only elderly adult's demans and daily behaviours. Just one movement as partial seizure, speech or somnolence should be the sign of circulatory failure or hemorrhage . Even if there is no symptoms with the history of anticoagulant use, the possibility of intracranial hemorrhage to be seen in 7-14% should be kept in mind in these population[6]. In our study, the rate of bleeding after head trauma was lower than the literature data with the ratio of 3.2%.

Pelvic fractures are related with greater morbidity, including major hemorrhage and mortality[7-8]. Every elderly patient with a pelvic fracture should be investigated for the evidence of hemorrhage (eg, elevated heart rate, ongoing transfusion requirements, pelvic hematoma on standard CT). Especially in pelvic traumas retroperitoneal hemorrhage should be keep in mind. 20% of our pelvic trauma patients had pelvic fractures. One of these patient who had pelvic fracture had been in hypovolemic shock.

In extremity traumas signs and complaints should be the guide of lession. Musculoskeletal injuries are the most common type of injury in these fall patients. Many of these injuries are associated with increased mortality. If the patient has a long bone fracture, it should not be forgotten that hypovolemic shock may occur due to bleeding. In our population with upper and/or lower extremity trauma after fall had 81,8% long bone fracture.

As with all trauma cases, the physical examination of the patients should be performed top to toe carefully in all age group. Close follow-up is required for these groups of pa-

tients who have a history of many chronic medications and whose compensation mechanisms will slow down because of these medications. In this specific populations patients who were admitted to emergency services should examine carefully, vital signs were follow closely and watch their conscious continuously. Risks should be considered individually and preventive maneuver should be taken when evaluating all systems. They can be life-saving for them if they say, show or find anything they carry after fall.

References

1. Jacobs DG. Special considerations in geriatric injury. Curr Opin Crit Care 2003; 9:535
2. Sterling DA, O'Connor JA, Bonadies J. Geriatric falls: injury severity is high and disproportionate to mechanism. J Trauma 2001; 50:116
3. Bergeron E, Clement J, Lavoie A, et al. A simple fall in the elderly: not so simple. J Trauma 2006; 60:268
4. Labib N, Nouh T, Winocour S, et al. Severely injured geriatric population: morbidity, mortality, and risk factors. J Trauma 2011; 71:1908
5. Kirkpatrick JB, Pearson J. Fatal cerebral injury in the elderly. J Am Geriatr Soc 1978; 26:489
6. Goldstein JN, Thomas SH, Frontiero V, et al. Timing of fresh frozen plasma administration and rapid correction of coagulopathy in warfarin-related intracerebral hemorrhage. Stroke 2006; 37:151
7. Callaway DW, Wolfe R. Geriatric trauma. Emerg Med Clin North Am 2007; 25:837
8. Henry SM, Pollak AN, Jones AL, et al. Pelvic fracture in geriatric patients: a distinct clinical entity. J Trauma 2002; 53:15

Review
Eurasian Journal of Critical Care

Management of Congestive Heart Failure and Pulmonary Edema

Ramazan Güven[1]

[1]Department of Emergency Medicine, Kanuni Sultan Suleyman Education and Research Hospital University of Health Science, İstanbul, Turkey

Abstract

Congestive heart failure (CHF) is one of the most important condition received by emergency physcians. Current review describes the management of CHF and pulmonary edema based on the latest updates, with a priority in the 2016 guidelines of the European Society of Cardiology (ESC). In the latest guidelines, they were more algorithmic approach than previous ones. The importance of step treatment was emphasized based on these algorithms. It was seen that treatment and management were done with prognostic classifications especially Nohria-Stevenson classification.

Key words: Congestive Heart Failure, Pulmonary Edema

Introduction

Heart failure (HF) is defined as the condition of the heart muscle that does not pump blood to vital organs at a sufficient level[1]. The term of congestive HF is given to patients with breathlessness and edema whereby the heart fails to pump effectively[2]. The most recent data on the prevalence of HF in our country was obtained from the HAPPY study. According to this study, the prevalence of HF in our country is higher than in western countries, and the estimated prevalence is 6.9%[3].

The latest guideline of the European Society of Cardiology (ESC) for the management of HF was published in 2016. One of the most important changes in previous guidelines was related to HF classification. In this classification made according to left ventricular ejection fraction (LVEF). LVEF, below 40%; HF with low ejection fraction, patients with a LVEF in the range of 40–49%; heart failure with mid-range ejection fraction, LVEF ≥50%; HF with preserved EF[4, 5]. The Nohria-Stevenson classification, one of the prognostic classifications, was one of the highlights of the guideline. In this classification, the presence of congestion (dry-wet) condition of patients with HF and the presence of hypoperfusion (cold-warm) at rest are evaluated (Table 1). Killip classification is one of the prognostic classification used for acute coronary syndrome patients. The presence of pulmonary edema in this classification is considered to be Killip class III (Table 2). The New York Heart Association classification is the most well-known and widely used classification of CHF (Table 3)[6].

Epidemiology

The precipitants of acute HF are examined under two headings: cardiac and non-cardiac. Coronary ischemic diseases and hypertension are the most common causes of acute HF for in cardiac precipitants.

Cardiac precipitants;

- Heart valve diseases
- Cardiomyopathy
- Myocarditis
- Heart rhythm disorders

Combination of negative inotropic agents (verapamil, beta-blockers, diltizem, etc.)

- Non-compliance with treatment

Non-cardiac precipitants;

- Endocrinological diseases (diabetes, thyroid disorders)
- Pulmonary diseases (pulmonary embolism, asthma, COPD)
- Increased blood volume (anemia)
- Conditions leading to sodium retention such as renal failure, medication and addiction (steroids, excessive alcohol intake, illicit substance abuse)
- Other (cerebrovascular accident, surgery)

Corresponding Author: Ramazan Güven **e-mail:** drramazanguven@gmail.com
Received: 02.01.2019 • **Accepted:** 24.02.2019

Table 1. Classification of Nohria-Stevenson.

(-)		Presence of congestion during rest	
		(+)	
Presence of hypoperfusion at rest	(-)	warm and dry	warm and wet*
	(+)	cold and dry **	cold and wet

* Pulmonary congestion, orthopnea / paroxysmal nocturnal dyspnoea, peripheral (bilateral) edema, jugular venous dilatation, congestive hepatomegaly, acid, hepatojugular reflux
** Cold sweaty extremities, oliguria, mental confusion, dizines, narrowed pulse pressure

Table 2. Classification of Killip.

Class	Physical Examination Findings
I	No evidence of heart failure
II	S3 (+), ral, tachycardia in <50% of lung areas
III	S3 (+), > 50% of lung areas
IV	Cardiogenic shock

Pathophysiology

It is important to understand the working principle of the heart in order to understand the treatment modalities of HF. The cardiac output is the amount of blood that the heart pumps in one minute, which determines heart rate, contractility, preload and afterload. As the heart rate increases, cardiac output increases at the same rate. Similarly, as the contractile strength of the heart increases, the cardiac output increases with that rate[7, 8].

Unlike other parameters that affect HF, there is a confusion about the preload and afterload. Preload refers to ventricular wall tension (or wall stress) that occurs during the diastole period of the heart[8]. The Frank-Starling law is often used in the preliminary explanation. According to this law, the ventricle volume increases with the blood supply to the ventricle, which affects the tension of the ventricular muscle fibers, which allows the heart to pump blood more strongly. As the amount of air in the balloon increases, the tension of the balloon increases. When the balloon tension is maximized the balloon's mouth is opened, the balloon starts to discharge air more strongly. As seen in the Frank-Starling law and balloon sample, the most important factor affecting the preload is the increased wall tension as a result of the amount of blood flowing into the ventricle. Because of Frank-Starling law does not function correctly in HF, these patients should be given precautionary measures to reduce preload[9].

Afterload is the force that the ventricles should be able to pump blood to the body, which depends more on arterial blood pressure and vascular tone. An example of a bike ride uphill is given for the afterload. According to this example, a driver riding an uphill bike has more energy than a straight road. In this case, the slope of the hill should be reduced or the number of contractility and pedals should be increased. Hypertension is the most common cause of afterload increase and it is necessary to reduce blood pressure (reduce slope)[10, 11].

Clinical Features

Shortness of breath is the most common symptom of CHF. In the early period of CHF, shortness of breath during physical activity starts to develop during resting periods. In the more critical stages of CHF, there are more serious symptoms such as breathingonly in the sitting position (orthopnea) and waking up with air starvation (paroxysmal nocturnal dyspnoea, PND). Patients with chest pain, palpitation, cough, malaise, nausea, and mental status, as well as HF-specific symptoms such as orthopnea and PND, are also referred to the emergency department. Other non-specific symptoms include swelling of the abdomen (acid), scrotum and other parts of the body due to the decrease of venous circulation. While shortness of breath develops in the left HF, other symptoms (swelling, pain in the abdomen and extremities) are more likely to develop in the right HF[12].

Table 3. Classification of New York Heart Association Congestive Heart Failure

I (Mild)	No limitation of physical activity. Ordinary physical activity does not cause chest pain, breathlessness or palpitations
II (Mild)	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in chest pain, breathlessness or palpitations
III (Moderate)	Marked limitation of physical activity without discomfort. Symptoms at rest can be present. If any physical activity is undertaken, discomfort is increased.
IV (Severe)	Unable to carry on physical activity without discomfort. Symptoms at rest can be present. If any physical activity is undertaken, discomfort is increased.

Physical Examination Findings

Cardiovascular findings[13];

- Tachycardia due to sympathetic nervous system activation: It should be kept in mind that users with medications that reduce heart rate, such as beta blockers, may develop CHF without tachycardia.
- S3 hearing with auscultation
- Heart rhythm disorders: Atrial fibrillation, ventricular ectopic pulses, reduced stroke volume-induced pulse disorders (pulsus alternans; a strong weak pulse, pulsus paradoxus; systolic pressure less than 10 mmHg during inspiration)
- Abnormal values in blood pressure (patients with CHF in the emergency room mostly present with systolic pressure> 140 mmg)
- Low pulse pressure level due to stroke volume reduction (normally 30-50 mmHg)

Respiratory findings[14];

- Tachypnea
- Rales with auscultation and wheezing
- Cheyne-Stokes respiration in more severe cases (respiration characterized by periods of hyperpnea, hypopnea, apnea**)**

Other findings[15];

- Jugular vein fullness: Since there is no valve between the vena cava and the right atrium, right atrial pressure changes lead to fluctuations in the vena cava. The patient's body is increased by 45 degrees and the measurement is made.
- Hepato-jugular reflux: This is the state of the jugular vein fullness after pressure to the liver, > 4 cm in the venous fullness.
- Hepatomegaly, right upper quadrant sensitivity
- Gode-releasing edema: from the bones to the feet on the back, in the legs
- Cold, pale and damp skin due to cyanosis

Diagnostic Approach

It is vital that diagnostic studies are performed correctly and quickly in order to detect the precipitating causes of acute HF patients and to initiate the treatment as soon as possible. In addition, the patient's history, additional cardiovascular diseases, if any, and the medications used should be noted. Diagnostic tools in CHF patients are examined under four diagnostic tools: electrocardiography (ECG), lung X-ray, laboratory tests and echocardiography.

The most specific findings of lung X-ray in CHF are pulmonary venous congestion, pleural effusion, interstitial or alveolar edema and cardiomegaly. In addition, lung X-ray is used to exclude alternative diagnoses such as pneumonia. However, it should be kept in mind that lung X-ray may be completely normal in 20% of patients. Echocardiography should be planned primarily for hemodynamically unstable patients, such as cardiogenic shock, and for patients who are thought to be structural and functional cardiac disorders.

BNP or NT-proBNP should be studied for each patient suspected of acute CHF. Although BNP <100, NT-proBNP <300 pg / mL excludes acute HF, the rise of natriuretic peptides does not always confirm acute HF. It should be noted that there are many cardiac (atrial and ventricular tachyarrhythmias, pulmonary embolism, myocarditis) and non-cardiac causes (chronic obstructive pulmonary disease, advanced age, renal failure and liver diseases, severe burns, hormonal disorders) that cause the elevation of natriuretic peptides. It should also be underlined that natriuretic peptides may be low in end-stage decompensated heart failure. Cardiac troponins have been studied by many clinicians in CHF. Elevated cardiac troponins due to myocyte injury in acute coronary syndromes are known to be associated with higher prognosis and mortality in CHF[16]. Procalcitonin has been used to make antibiotic decisions in additional cases of infection (pneumonia)[17]. Other laboratory tests, such as BUN, electrolytes, are evaluated before deciding on the discharge of the CHR patient.

Treatment and Management

First of all, the patient should be monitored, vital signs (blood pressure, number of breaths, pulse oximetry) should be evaluated and ECG should be taken at regular intervals. Although urinary catheter is not necessary, urine output should be followed. The ESC 2016 guideline recommends investigating acute HF into two phases, the urgent phase of the emergency contact and the immediate phase (60-120 minutes) after initial contact. In the urgent phase, the patient should be evaluated in terms of cardiogenic shock and respiratory failure. If there is cardiogenic shock in this evaluation; the patient should be provided with circulation support (pharmacological and mechanical). In the presence of respiratory failure, oxygen, CPAP / BPAP and / or endotracheal intubation should be performed. İmmediate phase where the precipitant causes are investigated and then switched. It should be kept in mind that a multidisciplinary approach is required for patients with CHF. The ESC 2016 guideline proposes an algorithm based on the Nohria-Stevenson classification (hot and dry, hot and wet, cold and dry, cold and wet) for the early management of patients with CHF[4].

Although routine oxygen therapy is not recommended for non-hypoxemic patients in acute HF, continuous oxygen monitoring should be performed and the patient should be monitored. Performed pH and lactate form arterial blood gas. Non-invasive mechanical ventilation (CPAP, BiPAP)

should be considered in patients with SpO_2 <90% and pale number> 25 / min(ESC 2016 recommendation level 2A, level of evidence C). Endotracheal intubation should considered with Hypoxemia (PaO_2 <60 mmHg), hypercapnia ($PaCO_2$> 50 mmHg) and acidosis (pH <7.35)[18].

Patients with acute symptoms of CHD should be given 20-40 mg of the first visit to the emergency department and IV furosemide should be given as an oral dose for chronic CHF patients. As in the DOSE study, patients with high-dose diuretics (2.5 times the oral dose) recovered faster[19]. These high dose ratios, which result in greater weight changes, cause temporary disturbances in renal function, but long-term effects are limited. Furosemide may given as bolus or infusion according to the symptoms and clinical condition. Vasodilators show effect, reducing venous and arterial tone, which also reduces the preload and afterload. In patients with systolic blood pressure > 90 mmHg, vasodilator (nitroglycerin 10-20 µg / min, nitroprusside 0.3 µg/kg/min) should be started. Conversely, patients with hypotensive and hypoperfusion symptoms should be given inotropic agents (2-20 µg/kg/min dobutamine, 3-5 µg/kg/dk dopamin and in the presence of severe hypotension the dose of dopamine >5 µg/kg/dk) and vasopressors (norepinephrine dose 0.2-1.0 µg/kg/dk). However, these agents may cause myocardial ischemia and arrhythmias due to adrenergic effects, ECG monitoring is required.

Levosimendan (2016 ESC recommendation level 2B)[20] is one of the most important therapeutic agents in the recent HF guidelines. By increasing the calcium sensitivity of contractile proteins in the myocardium, the inotropic effect leads to a decrease in peripheral vascular resistance (preload and afterload) by opening ATP-dependent potassium channels in vascular smooth muscles[21]. In contrast to other inotropic agents, levosimendan has an inotropic effect without increasing myocardial oxygen consumption. This is the reason why they are preferred primarily in patients with CHD due to coronary artery disease. Levosimendan improves cardiac output by better correction of hemodynamics than dobutamine and leads to a decrease in PCWP (pulmonary capillary end pressure)[22]. Although there are conflicting results on the effects on mortality, studies on reducing mortality are more prevalent[23]. The recommended loading dose is 6-12 µg/kg/min in 10 minutes and the infusion dose is 0.05-0.2 µg/kg/min.

Among other treatment agents, digoxin is recommended in the presence of AF and rapid ventricular rate (>110 bpm) and given in boluses 0.25-0.5 mg i.v. Although it was thought that morphine reduced anxiety in CHF patients and relieved breathlessness, some studies showed that mortality increased[24]. Ultrafiltration is recommended by ESC as one of the alternative treatment options in cases where there is no response to medical agents (diuretics, etc.) (recommendation level 2B, level of evidence B). In patients with acute renal failure, this level of recommendation is 2A, and the level of evidence is C[25]. Other conditions accompanying these patients requiring ultrafiltration; severe hyperkalemia (K +> 6.5 mmol / L), severe acidemia (pH <7.2), BUN> 150 mg / dL and serum creatinine> 3.4 mg / dL.

Criteria for ICU admission for acute HF;

- The need for intubation
- Hypoperfusion symptoms
- SpO_2 <90% despite oxygen support
- The use of accessory muscles, number of breaths> 25 / min

In conclusion, it should be evaluated whether there is cardiogenic shock and / or respiratory failure in the patients with acute symptoms of CHF in the emergency department. Accordingly, circulatory and respiratory support should be given. On the other hand, by performing diagnostic studies, the presipitant causes should be determined and treated quickly.

References

1. Xanthakis V, Enserro DM, Larson MG, Wollert KC, Januzzi JL, Levy D et al. Prevalence, neurohormonal correlates, and prognosis of heart failure stages in the community. JACC Heart Fail 2016;4:808–15.
2. Figueroa MS and Peters JI. Congestive Heart Failure: Diagnosis, Pathophysiology, Therapy, and Implications for Respiratory Care. Respir Care 2006;51(4):403-12.
3. Değertekin M, Erol Ç, Ergene O, Tokgözoğlu L, Aksoy M, Erol MK et al. Türkiye'deki kalp yetersizliği prevalansı ve öngördürücüleri: HAPPY çalışması. 2012; 40(4):298-308.
4. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JG, Coats AJ, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J 2016;37:2129–200.
5. Sarı İ, Çavuşoğlu Y, Temizhan A, Yılmaz MB ve Eren M. 2016 Avrupa ve Amerika Kalp Yetersizliği Klavuz Güncellemeleri: Yenilikler, benzerlikler, farklılıklar ve netlik kazanmış konular. Turk Kardiyol Dern Ars 2016;44(8):625-36.
6. The Criteria Committee of the New York Heart Association. Nomenclature and Criteria for Diagnosis of Disease of the Heart and Hreat Vessels. 9th ed. Boston, Mass: Little, Brown&-Co;1994:253-6.
7. Sagawa K, Suga H, Shoukas AA and Bakalar KM. End-systolic pressure/volume ratio: a new index of ventricular contractility. Am J Cardiol 1977;40:748-53.
8. Reddi BA, Shanmugam N and Fletcher N. Heart failure-pathophysiology and inpatient management. BJA Education, 2017;17(5):150-60.
9. Guadalajara-Boo JF. Undergstanding Heart Failure. Int J Cardiovasc Res 2016;6.
10. Sandler H and Dodge HT. Left ventricular tension and stress in man. Circ 1963;13:91-104.
11. Gunther S and Grossman W. Determinants of ventricular function in pressure-overload hypertrophy in man. Circulation 1979;59:679-88.

12. Francis GS and Tang WHW. Pathophysiology of Congestive Heart Failure. Rev Cardiovasc Med. 2003;4(suppl 2):14-20.
13. Dosh SA. Diagnosis of heart failure in adults. Am Fam Physcian. 2004;70(11):2145-52.
14. Institute for Clinical Systems Improvement (ICSI). Heart failure in adults. Bloomington, Minn.:Institute for Clinical Systems Improvement (ICSI); 2009:95.
15. Bibbins-Domingo K, Lin F, Vittinghoff E, Barrett-Connor E, Hulley SB, Grady D et al. Predictors of heart failure among women with coronary disease. Circulation 2004;110(11):1424-30.
16. Peacock WF, De Marco T, Fonarow GC, Dierecks D, Wynne J, Apple FS et al. Cardiac Troponin and Outcome in Acute Heart Failure. N Engl J Med 2008;358:2117-26.
17. Rhee C. Using Procalcitonin to Guide Antibiotic Therapy. Open Forum Infect Dis. 2017;4(1).
18. Vital FMR, Ladeira MT, Atallah AN. Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary edema. Cochrange Database Syst Rev 2013;5:CD005351.
19. Felker GM, Lee KL, Bull DA, Redfield MM, Stevenson LW, Goldsmith SR, et al. Diuretic strategies in patients with acute decompensated heart failure. N Engl J Med 2011;364:797–805.
20. Ural D, Çavuşoğlu Y, Eren M, Karaüzüm K, Temizhan A, Yılmaz MB et al. Diagnosis and management of acute heart failure. Anatol J Cardiol 2015;15:860-89.
21. Cavusoglu Y. The use of levosimendan in comparison and in combination with dobutamine in the treatment of decompensated heart failure. Expert Opin Pharmacother 2007; 8: 665-77.
22. Gruhn N, Nielsen-Kudsk JE, Theilgaard S, Bang L, Olesen SP, Aldershvile J. Coronary vasorelaxant effect of levosimendan, a new inodilator with calcium-sensitizing properties. J Cardiovasc Pharmacol 1998; 31: 741-9.
23. Landoni G, Biondi-Zoccai G, Greco M, Greco T, Bignami E, Morelli A, et al. Effects of levosimendan on mortality and hospitalization A meta-analysis of randomized controlled studies. Crit Care Med 2012; 40: 634-46.
24. Iakobishvili Z, Cohen E, Garty M, Behar S, Shotan A, Sandach A, et al. Use of intravenous morphine for acute decompensated heart failure in patients with and without acute coronary syndromes. Acute Card Care 2011;13:76–80.
25. Costanzo MR, Saltzberg MT, Jessup M, Teerlink JR, Sobotka PA. Ultrafiltration is associated with fewer rehospitalizations than continuous diuretic infusion in patients with decompensated heart failure: results from UNLOAD. J Card Fail 2010;16:277–284.