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The journal's target audience includes Emergency Medicine experts, School members who conduct scientific studies and work in the Emergency Medicine field, researchers, experts, assistants, practicing physicians and other health sector professionals.

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Review Articles: Reviews which are prepared by authors who have extensive knowledge on a particular field and whose scientific background has been translated into high volume of publication and higher citation potential are taken under review. The authors may be invited by the journal. Reviews should be describing, discussing and evaluating the current level of knowledge or topic used in the clinical practice and should guide future studies. Please check Table 1 for limitations for Review Articles.

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Tables

Tables should be included in the main document, presented after the reference list and they should be numbered consecutively in the order they are referred to within the main text. A descriptive title must be placed above the tables. Abbreviations used in the tables should be defined below the tables by footnotes (even if they are defined within the main text). Tables should be created using the "insert table" command of the word processing software and they should be arranged clearly to provide an easy reading. Data presented in the tables should not be a repetition of the data presented within the main text but should be supporting the main text.

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Type of manuscript	Word limit	Abstract word limit	Reference limit	Table limit	Figure limit
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Review Article	5000	200	50	6	10 or total of 20 images
Case Report	1500	200	10	No tables	10 or total of 20 images
Letter to the Editor	500	N/A	5	No tables	No media
Scientific letter	900	N/A	10	No tables	2 or total of 4 images
Clinical Imaging/ Visual Diagnosis	400	N/A	5	No tables	3 or total of 6 images
History	900	N/A	10	No tables	3 or total of 6 images
Publication ethics	900	N/A	10	No tables	No media

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Figures, graphics and photographs should be submitted as separate files (in TIFF or JPEG format) through the submission system. The files should not be embedded in a Word document or the main document. When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system. Images should not be labelled (a, b, c, etc.) to indicate figure subunits. Thick and thin arrows, arrowheads, stars, asterisks and similar marks can be used on the images to support figure legends. Like the rest of

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Limitations, drawbacks and shortcomings of original articles should be mentioned in the "Discussion" section before the conclusion paragraph.

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The Interaction Level of Emergency Department Patients with Their Family Physicians and Their Expectations from Primary Health Care: A Survey Study

Hasan İdil, Yeşim Eyler, Turgay Yılmaz Kılıç, İnci Akgün Bayzın, Cansu Ülgüdür, Murat Yeşilaras

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Abstract

Aim: One of the main reasons of emergency department (ED) crowding is that non-urgent patients often use EDs instead of primary health care. The aim of this study was to determine the interaction level of ED patients with their family physicians and their expectations from primary health care.

Materials and Methods: This study was carried out with adult patients who admitted to ED within the regular working hours in a period of one month. The study was conducted through questionnaires in a training and research hospital, in Turkey. The data of 800 patients were analyzed and compared, half of which were from non-urgent patients.

Results: Urgent patients were mostly between 40 and 68 years of age with chronic diseases, while non-urgent patients were between 28 and 48 years of age with a higher level of education and employment in a full-time job. It was determined that patients often applied to ED on their own decision. Approximately one third of the patients stated that they did not initially consult their family physicians about their health problems. As recommendations, both patient groups indicated that the primary health care should be more accessible and it should provide more medical analysis.

Conclusion: It was observed that non-urgent patients did not interact adequately with their family physicians. The recommendations of the patients should be taken into consideration and they should be encouraged to use primary health care more efficiently. This may be effective in reducing the ED crowding.

Keywords: Emergency department, crowding, non-urgent, family physicians, primary health care

Introduction

The emergency department (ED) crowding is an important problem worldwide (1,2). One of the fundamental reasons for this problem is that non-urgent patients frequently prefer EDs (3,4). This situation negatively affects the quality of patient care and the satisfaction levels of the patients and the ED staff (1,2,5).

In several studies, it was determined that at least one-third of the patients applying to the ED were non-urgent (4-6). There is no specific universal definition of non-urgent patients. Generally, these are described as patients who can also be treated in the primary care (7). Even in a research study conducted with the assessments of general practitioners, 43% of ED patients were found to be eligible for being treated in primary care (8). Therefore, primary health care is an important factor affecting ED crowding.

In EDs, the severity of patients is determined according to triage levels. Regarding the 5-level triage system used in Turkey, the patients are classified as red (level 1 and 2), yellow (level 3 and 4) and green (level 5). This classification was derived from the Canadian Triage and Acuity Scale. Level 5 patients are in the

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lowest risk group and do not need urgent intervention. Most of these patients can also be treated in primary care (9).

Worldwide, primary health care is mostly provided by family physicians. In this system, it is aimed to have the patients examined initially by family physicians and then have them referred to the advanced healthcare centers if necessary. However, it is seen that non-urgent patients do not prefer family physicians frequently and they continue to use ED (4,10).

In this study, it was aimed to investigate the basic characteristics of the patients admitted to the ED, their level of interaction with their family physicians, and their further expectations from primary health care services. Ultimately, it was targeted to contribute to the more efficient utilization of EDs and primary health care services.

Materials and Methods

This cross-sectional observational study was conducted between 1-30 April 2018 at an ED of a training and research hospital with approximately 180,000 adult patient applications annually. In this central hospital in the Aegean Region of Turkey, comprehensive health services are delivered in all disciplines related to surgery and internal diseases. The research was commenced after obtaining approval from the local board of ethics.

This survey study was planned to be conducted with adult patients (>18 years of age) who were admitted to ED when family physicians were available (between 8 am and 4pm on weekdays). The five-level triage system was in use at the ED in which the study was conducted. Level 3, 4 and 5 patients who agreed to participate were included in the study by the triage nurses based on convenience sampling. Non-urgent patients were selected from Level 5 patients. The patients who were also suitable for treatment in the primary care were considered to be non-urgent. The nurses in the triage unit had at least one year of experience in ED.

The patients were asked to fill in the survey form and leave it to the triage unit before leaving ED. It was stated that they could get help from the triage nurses or their companions if needed. The center in which the study was conducted reached approximately 5000 ED applications per month, meeting the inclusion criteria. It was planned to conduct 30 to 40 surveys daily to include 15% of these patients in the study. Furthermore, it was planned to select half of the patients from the non-urgent group.

The patients who did not fill in the survey form or who did not complete the questionnaire were excluded from the study. The patients who were level 1 or 2, who did not accept to participate in the study, whose family physicians had changed in the last 3 months, who had language problems, who had low mental status and who were not suitable to fill in a survey because of reasons such as pain or anxiety were excluded.

The survey consisted of five sections. In the first section, the demographic characteristics (age, gender, marital status), socio-economic characteristics (health insurance, employment status, education level) and chronic diseases were investigated. In the second section, the patients were asked to grade their interactions with the family physicians using the satisfaction scale. In the third section, the patients were asked the reasons for their last visit to the family physicians. In the fourth section, the patients were required to answer some questions aiming to determine the level of interactions with their family physicians. In the fifth section, the expectations and recommendations of the patients regarding primary health care services were investigated. At the end of the study, answers given to the open-ended questions were grouped with respect to their frequency. The results obtained from non-urgent and urgent patient groups were compared and the statistical differences between them were determined.

Statistical Analysis

SPSS 22.0 (SPSS Inc., Chicago, Illinois, USA) software package was used in the analysis of the data obtained. Qualitative data were expressed as number and percentages, and quantitative data as median, interquartile range (IQR), minimum (min) and maximum (max). Pearson's chi-square test or Fisher's exact test was used for the analysis of qualitative variables and Mann-Whitney U test was used for the analysis of quantitative variables. In all analyses, the odds ratios were given with 95% confidence interval (95% confidence interval) and $p<0.05$ was considered statistically significant.

Results

Forty-three patients who did not complete the survey were excluded from the study. Results from to a total of 800 patients, half of which were non-urgent, were analyzed. The median age of the patients was 39 years (min=18, max=83, IQR= 28-48 years) in the non-urgent group and it was 54 years (min=18, max=93, IQR=40-68 years) in the urgent group ($p<0.001$). The median residence time in patients' current residence was 12 years (IQR=5-12 years) in the non-urgent group and 19 years (IQR=5-35 years) in the urgent group. The basic characteristics of the patients with respect to the triage groups are shown in Table 1.

The satisfaction of the patients with primary health care services was investigated and patients were asked to grade their interactions with their family physicians. The results obtained using the satisfaction scale are shown in Table 2.

The patients were asked about the reasons of their last family physician visits and the answers obtained were grouped at the end of the study. The reasons of application according to patient groups are shown in Table 3.

Table 1. The basic characteristics of the patients

	Non-urgent patients (n=400)	Urgent patients (n=400)	Odds ratio (95% CI)	p
Gender				
Male	205 (51.3%)	169 (42.3%)	1.44 (1.09-1.90)	0.011
Female	195 (48.8%)	231 (57.8%)		
Marital status				
Married	289 (72.3%)	291 (72.8%)	1.03 (0.75-1.40)	0.874
Single	111 (27.8%)	109 (27.3%)		
Chronic disease				
Yes	102 (25.5%)	230 (57.5%)	3.95 (2.93-5.33)	<0.001
No	298 (74.5%)	170 (42.5%)		
Health insurance				
Yes	390 (97.5%)	396 (99.0%)	2.54 (0.79-8.16)	0.106
No	10 (2.5%)	4 (1.0%)		
Employment status				
Employed	221 (55.2%)	112 (28.0%)	3.17 (2.37-4.26)	<0.001
Unemployed	179 (44.8%)	288 (72.0%)		
Education level				
Primary education or less	197 (49.3%)	265 (66.3%)	2.02 (1.52-2.69)	<0.001
More than primary education	203 (50.8%)	135 (33.8%)		

CI: Confidence interval

Table 2. Interaction levels of patients with their family physicians

	Non-urgent patients n (%)	Urgent patients n (%)	Total n (%)	p
Very good	69 (17.3%)	106 (26.5%)	175 (21.9%)	<0.01
Good	211 (52.8%)	196 (49.0%)	407 (50.9%)	
Fair	39 (9.8%)	30 (7.5%)	69 (8.6%)	
Poor	10 (2.5%)	11 (2.8%)	21 (2.6%)	
Very poor	2 (0.5%)	4 (1.0%)	6 (0.8%)	
No interaction	69 (17.3%)	53 (13.3%)	122 (15.3%)	
	400 (100%)	400 (100%)	800 (100%)	

Table 3. The reasons of patients' last visits to family physicians

	Non-urgent patients n (%)	Urgent patients n (%)	Total n (%)	p
Renewal of prescriptions	106 (26.5%)	159 (39.8%)	265 (33.1%)	<0.001
URTI symptoms	83 (20.8%)	52 (13.0%)	135 (16.9%)	0.003
Musculoskeletal system pain	44 (11.0%)	20 (5.0%)	64 (8.0%)	0.002
Vaccination	19 (4.8%)	21 (5.3%)	40 (5.0%)	0.862
Obtaining incapacity report	18 (4.5%)	17 (4.3%)	35 (4.4%)	0.862
Infant and pregnancy follow-ups	13 (3.3%)	17 (4.3%)	30 (3.8%)	0.458
Abdominal pain	7 (1.8%)	17 (4.3%)	24 (3.0%)	0.038
Other reasons	31 (7.8%)	42 (10.5%)	73 (9.1%)	0.177
Has no applications	79 (19.8%)	55 (13.8%)	134 (16.8%)	0.023
	400 (100%)	400 (100%)	800 (100%)	

URTI: Upper respiratory tract infection

The interaction levels of the patients with family physicians, which were previously investigated with satisfaction scale, were re-evaluated with some questions. These questions and answers according to patient groups are shown in Table 4.

The answers given to the 4th question in Table 4 were classified at the end of the study. It was determined that 627 patients (78.4%) applied to the ED on their own decision, 72 patients (9%) with the consent of someone who is not a health professional (family, employer, friend etc.), 68 patients (8.5%) with the guidance of the family physicians and 33 patients (4.1%) with the guidance of other health professionals (doctor, nurse, health officer etc.).

The expectations and recommendations of the patients regarding the primary health care were asked. The answers given were classified at the end of the study and are shown in Table 5.

Discussion

The ED crowding is an important issue that should be investigated in all aspects. In this study, it was seen that the patients applying to the ED with non-urgent complaints did not utilize the primary health care efficiently. Consistent with this result, it is noted in the literature that non-urgent patients can also be treated in primary care (7,10,11). Determination of basic characteristics of these

Table 4. The questions about the level of interaction of patients with their family physicians

		Non-urgent patients (n=400)	Urgent patients (n=400)	Odds ratio (95% CI)	p
1. Do you know the name of your family physician?	Yes	252 (63.0%)	284 (71.0%)	1.44 (1.07-1.93)	0.016
	No	148 (37.0%)	116 (29.0%)		
2. Do you know the office address of your family physician?	Yes	365 (91.2%)	355 (88.8%)	1.32 (0.83-2.11)	0.238
	No	35 (8.8%)	45 (11.3%)		
3. Do you initially consult your family physician about your health problems?	Yes	276 (69.0%)	283 (70.8%)	1.09 (0.80-1.47)	0.590
	No	124 (31.0%)	117 (29.3%)		
4. Did your family physician guide you to the emergency department today? If someone else, please indicate	Yes	12 (3.0%)	56 (14.0%)	5.26 (2.78-9.98)	<0.001
	No	388 (97.0%)	344 (86.0%)		

CI: Confidence interval

Table 5. The expectations and recommendations of patients about primary health care

	Non-urgent patients n (%)	Urgent patients n (%)	Odds ratio (95% CI)	p
I have no recommendations (Satisfied or has no interaction)	256 (64.0%)	246 (61.5%)	1.11 (0.84-1.48)	0.467
It must provide more extensive medical analysis	58 (14.5%)	48 (12.0%)	1.24 (0.83-1.87)	0.296
My family physicians must be at a closer distance to me	14 (3.5%)	40 (10.0%)	3.06 (1.64-5.73)	<0.001
Family physicians must also be available outside the regular working hours	32 (8.0%)	10 (2.5%)	3.39 (1.64-7.00)	<0.001
Family medicine centers must not be crowded	12 (3.0%)	16 (4.0%)	1.35 (0.63-2.89)	0.442
Family physicians must not often refer to the advanced centers	8 (2.0%)	10 (2.5%)	1.26 0.49-3.22	0.632
Family physicians must provide possibility of home care	2 (0.5%)	14 (3.5%)	7.22 (1.63-31.97)	0.003
Other recommendations	18 (4.5%)	16 (4.0%)	1.13 (0.57-2.25)	0.729
	400 (100%)	400 (100%)	800 (100%)	

CI: Confidence interval

patients, their levels of interaction with the family physicians, and their opinions and recommendations about primary health care can be guiding for the solution of this serious problem. In this study organized with that aim, the results coming from the urgent and non-urgent patients are given separately. There is limited data presented in the literature in this manner.

According to the results of the study, it was seen that urgent patients were mostly female patients between 40 and 68 years of age and mostly had one or more chronic diseases. It was determined that non-urgent patients, in turn, were males between 28 and 48 years of age and mostly had a high level of education and a full-time job. These results were found to be consistent with the literature (3,10,12).

According to the results of the study, it was seen that one third of the patients consulted their family physicians for having their regular drugs prescribed again. This rate was higher in the urgent patient group (odds ratio=1.83; 95% confidence interval=1.36-2.47). According to the literature, it was found that the most frequent reasons of complaint-based family physician visits were similar with that of the ED applications. These include upper respiratory tract infections and musculoskeletal system pain (5,7,13). These results show that many of the patients applying to ED can also be treated in primary care.

Of the patients of interest, 17% stated that they never consulted their family physicians for any reason. Also, 15% of the patients did not score in the satisfaction scale because they had no interaction with their family physicians. These remarkable rates indicate that a significant proportion of patients have serious communication problems with their family physicians.

As a result of the questions investigating the interaction levels of the patients with their family physicians, it was determined that approximately one third of the patients did not know the names of their family physicians. This ratio was found to be higher among non-urgent patients (odds ratio=1.44; 95% confidence interval=1.07-1.93). It was learned that one in ten patients did not even know the office addresses of their family physicians. The reasons for these remarkable results should be investigated in detail.

Approximately one third of the patients stated that they did not initally consult their family physicians for their health problems. It is seen that these patients often prefer ED. This was found to be consistent with the results of other studies (3,10,12). It was seen that only 9% of the patients were referred to ED by their family physicians. It was determined that the patients often admitted to ED by their own decision or with the recommendations of non-healthcare professionals. This was found to be consistent with the literature (3,6,12). All these results reveal that the patients applying to EDs do not have a good level of contact and communication with their family physicians.

Both patient groups wished that primary health care units were more accessible and provided more extensive medical analysis. The urgent patients with a higher rate of chronic diseases and a higher mean age wished family physicians to be closer to them and to provide home care when needed. The non-urgent patients having a higher rate of employment in a full-time job, in turn, wished family physicians to be available also outside the regular working hours.

Study Limitations

The main limitation of the study was that it was conducted in a single center with a limited number of patients who agreed to participate in the research. Failure to evaluate patients with triage levels of 1 and 2 might have affected the outcomes of the urgent patients. Furthermore, the results may vary from region to region.

Conclusion

In conclusion, it can be postulated that non-urgent patients do not efficiently utilize the primary health care and they do not have sufficient level of interaction and communication with their family physicians. Considering the recommendations of the patients, primary health care services should be improved and used more effectively. Encouraging patients to consult their family physicians for their non-urgent complaints, tackling the difficulties in accessing the primary care and having the referral chain system among the healthcare units can help reduce ED crowding.

Ethics

Ethics Committee Approval: Ethical approval for this study was obtained from the Ethics Committee of University of Health Sciences - Tepecik Training and Research Hospital, İzmir, Turkey (approval number: 2018/1-53, date: 10/01/2018).

Informed Consent: Obtained.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: H.İ., T.Y.K., C.Ü., M.Y., Design: H.İ., İ.A.B., C.Ü., Data Collection or Processing: Y.E., İ.A.B., C.Ü., Analysis or Interpretation: H.İ., T.Y.K., M.Y., Literature Search: Y.E., T.Y.K., İ.A.B.; Writing: H.İ., Y.E., M.Y.

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Factors Affecting Prognosis Based on Right Coronary Artery Pathologies

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Abstract

Aim: Blood glucose levels, cardiac troponin (cTn) values within the first 12 hours, ejection fraction (EF), bundle branch block and Gensini scores of patients who were admitted to the emergency department for acute inferior myocardial infarction (AIMI) were compared based on the bundle branch of the occluded right coronary artery (RCA) with regard to prognosis.

Materials and Methods: The data of the study were acquired through retrospective review of 212 patients with AIMI (48 women, 164 men; median age=64 years) who applied to the emergency department due to chest pain and who were hospitalized in cardiology clinic between January 2012 and December 2015. The patients were divided into five RCA groups based on the angiography results. The level of mortality and three-vessel disease (TVD) were compared based on age, gender, blood glucose, EF, Gensini score (GS), cTn, bundle branch block, type of myocardial infarction and percentage of the occluded vein.

Results: Major percentage of the occluded vein, cTn, high-density lipoproteins, blood glucose, GS, and EF were statistically significant. The most frequent complication that occurred after acute myocardial infarction was ischemic heart failure (IHF) and it was mostly seen in RCA. Mortality, ventricular tachycardia (VT) and acute pulmonary edema (APE) were seen in acute ST-elevated MI that was close to circumflex artery (Cx) and lateral region. Cardiac tamponade or pericardial effusion was more frequent in mid-RCA. IHF, VT, atrioventricular complete block and APE were common in female patients. Male patients had only higher levels of cardiac tamponade and/or pericardial effusion ($p<0.05$). Mortality rate was 31.3% (n=15) in female patients and 11.6% (n=19) in male patients. Mortality and right bundle branch block were most common in acute inferoposterior myocardial infarction and IHF AIMI, as well as left bundle branch block was most common in inferolateral MI. TVD was more common in infarctions close to Cx, as well as most frequently in RCA when it was compared with the major occluded vein.

Conclusion: Diagnosing an acute coronary syndrome and determining its characteristics based on RCA and the involved segment might be a predictive vision for rapidly predicting complications in TVD and mortality.

Keywords: Right coronary artery, emergency department, acute myocardial infarction, mortality, three-vessel disease

Introduction

Myocardial infarction (MI) is one of the major causes of death in our country and in the world today and is described as "myocardial cell death depending on extended ischemia due to occlusion of the veins which feed the heart". There are two main coronary arteries that feed the heart: left main coronary artery (LCA) and right main coronary artery (RCA). While LCA predominantly feeds the anterior side of the heart and the left ventricle that has the actual function of pumping, RCA predominantly feeds the right ventricle and right atrium of the heart as well as the sinoatrial nodes. Both coronary arteries have a vital function for human life and the branches separating from these arteries may vary from person to person (1,2).

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RCA originates from its own ostium in the right coronary sinus and proceeds through the right atrioventricular (AV) orifice. RCA has several branches and the first of these branches is called as conus artery. This artery feeds the outflow tract of the right ventricle. The second sub-branch is the sinoatrial node artery that feeds the sinoatrial node. The right ventricular (RV) branch arises after this artery and the RCA segment which proceeds until this branch is called "proximal RCA". The "middle RCA" segment is the segment between the RV branch that feeds the right ventricle and acute marginal artery originating from the RCA. RCA segment following acute marginal artery branch is called "distal RCA" and this segment is divided into two parts as posterior descending artery (PDA) and posterolateral branch (PLB). PDA originates from the distal RCA in 80-85% of all subjects (3,4) and right predominance is mentioned in these individuals. PDA originates from the left circumflex coronary artery in remaining individuals and left predominance is mentioned in these individuals. While PDA feeds the posterior interventricular septum, PLB feeds the inferior left ventricle. RCA branches are schematically shown in Figure 1. Sohrabi et al. (5) detected RCA occlusion in 64.7% of acute inferior myocardial infarction (AIMI) cases in their study. Waldo et al. (6) detected RCA involvement in 467 of 824 cases diagnosed with isolated posterior MI (PMI).

We aimed to determine whether there was a relationship between the occluded segments and gender, age, ejection fraction (EF), blood glucose, Gensini score (GS), the first three measured cardiac troponin (cTn) levels, mortality, three-vessel disease (TVD) as well as bundle branch parameters in MI cases which progresses depending on occlusion of RCA, which is one of the main veins feeding the heart, or not in our study. Moreover, we determined the type of MI that progressed based on the occluded segment and its complications.

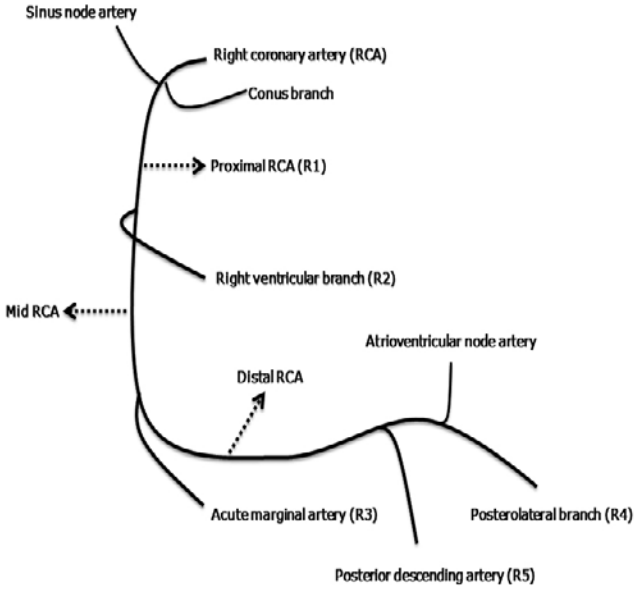

Figure 1. Schematic view of right coronary artery and its branches

RCA: Right coronary artery

Materials and Methods

Study Design and Population

Two hundred and twelve (48 women, 164 men; median age=64.56±8.88 years; range 45-77 years) patients, who applied to the emergency department due to chest pain and who were hospitalized to the cardiology clinic with a diagnosis of MI depending on occlusion in RCA and its branches between January 2012 and December 2015, were included in the study. Patients who had prostate cancer, pulmonary emboli and chronic liver diseases; who did not undergo blood transfusion; who had chronic kidney disease and new cerebrovascular disease; who did not have complete blood count, biochemistry, cTn, electrocardiography (ECG), echocardiography, lipid profile, risk factors, blood glucose, and angiography results were excluded from the study. Age, gender, ECG, coronary angiography reports, EF, blood glucose level on admission, lipid profiles, first three measured troponin I levels and bundle branch block (BBB) of these patients were retrospectively examined through the hospital automation system. Moreover, presence of diabetes, smoking, and hypertension was examined and recorded. cTn level on admission was classified as cTn 1, and cTn 2 for 6th hour and cTn 3 for 12th hour.

Mortality of all cases was obtained after 60 months follow-up. These results were decided by contacting the hospital automation system and/or the patients and their relatives by phone.

Patients who had chest pain and/or discomfort lasting at least 30 minutes and had ECG with STEMI in accordance with 2013 ACCF/AHA guidelines were included in the study (7). UA/NSTEMI was defined in accordance with the criteria of AHA/ACC Guideline for the Management of Patients With NSTE-ACS, 2014. All patients were checked by Transthoracic Echocardiography (TTE) (Philips Epiq 7, Philips Ultrasound, WA, USA) to see if they had focal wall motion abnormalities or not.

Written informed consent was obtained from all patients and the study was approved by the Ethical Committee Cumhuriyet University. number: 2018-01-26.

Cardiac Biomarker Analysis

Venous blood samples were obtained from the antecubital veins of patients in order to measure serum levels of Troponin I. Elecsys Troponin I STAT assay, cobas e 411 and Hitachi Roche analyzers were used to measure Troponin I levels. Troponin levels of patients were measured at admission, 6th and 12th hour.

Angiographic Analysis

Angiographic evaluations were performed by two experienced cardiologists who were blinded to the study. Discrepancies were resolved by consensus. Angiography was performed in all patients. As a result of the angiography, GS was calculated according to the system and vessel structure. The extent and severity of coronary artery disease (CAD) were assessed through GS (8).

Gensini Scoring System

GS was calculated by multiplying the severity coefficient, which was assigned to each coronary stenosis based on the degree of luminal narrowing (reductions of 25%, 50%, 75% 90%, 99%, and complete occlusion were respectively given Gensini scores of 1, 2, 4, 8, 16, and 32) through the coefficient identified based on the functional importance of the myocardial area supplied by that segment: LCA, 5; the proximal segment of the left anterior descending coronary artery (ADA), 2.5; the mid segment of the left ADA, 1.5; the apical segment of the left ADA, 1; the first diagonal branch, 1; the second diagonal branch, 0.5; the proximal segment of the circumflex artery (Cx), 2.5 (if RCA dominancy exist 3.5); the distal segment of the Cx, 1 (if dominant, 2); the obtuse marginal branch, 1; the PLB, 0.5; the proximal segment of the RCA, 1; the mid segment of the RCA, 1; the distal segment of the RCA, 1; and the PDA, 1 (8).

Statistical Analysis

The data obtained from this study were analyzed via SPSS 20 software package. Shapiro-Wilk test was used as test of normality. Mann-Whitney U and Kruskal Wallis tests were used to compare non-normally distributed variables between groups. Post-Hoc multiple comparison test was used in case of significant differences in Kruskal Wallis test. Two-way ANOVA was used in the analysis of multiple dependent variables with normal distribution. Multiple comparison tests were used in case where there were no significant differences. Chi-Square analysis was used to examine the relationships between the groups in terms of nominal variables. Spearman's correlation was used for the correlation of values. $P<0.05$ was considered statistically significant.

Results

The mean occlusion rate was 83.97±14.37 percent. Mean cTn 1 was 3.08±3.43 mg/dL, cTn 2 was 8.06±9.72 mg/dL and cTn 3 was 18.21±16.29 mg/dL. Mean triglyceride (TG) level was 151.91±70.05 mg/dL, cholesterol was 198.48±72.54 mg/dL, high-density lipoprotein (HDL) was 35.6±7.98 mg/dL, low-density lipoprotein (LDL) was 122.20±81.00 mg/dL, very low-density lipoprotein (VLDL) was 33.19±18.45 mg/dL and blood glucose level was 139.60±62.99 mg/dL. Gensini score was 67.45±50.32 points and EF was 46.67±13.13. TG, LDL, and VLDL were not statistically significant; but the percentage of the occluded vein, cTn 1, HDL, blood glucose, GS, and EF were statistically significant (Table 1).

The most common complication after MI was ischemic heart failure (IHF) when the analysis was conducted based on the structure of the occluded vein as well as it was seen in RCA. Mortality, ventricular tachycardia (VT) and acute pulmonary edema (APE) were especially seen in ST-elevated MI (STEMI) close to Cx and lateral region. Cardiac tamponade and pericardial effusion were seen more frequently in mid-RCA. Although diabetes was not significant, other values were found to be significant based on the structure of the occluded vein (Table 2).

IHF, VT, AV complete block and APE were more frequent in female patients, whereas only cardiac tamponade or pericardial effusion was more frequent in male patients when complication analysis based on gender was conducted. Mortality was 31.3% (n=15) in female patients and 11.6% (n=19) in male patients. Mortality, complications, TVD and BBBs were significantly different based on gender (Table 3).

Mortality and right BBB were most commonly seen in acute inferoposterior MI (IPMI) and IHF AIMI, as well as left BBB, was seen most frequently in inferolateral MI (ILMI) when they were examined based on the type of acute MI. TVD was seen more frequently in infarctions close to Cx and most frequently in RCA regarding the occluded major vein. MI types were found statistically significant in terms of EF and age (Table 4).

Discussion

In the literature review, we could not find any studies related to RCA with emergency department admission, AIMI which involved the bundle branches of RCA and frequent accompanying posterior MI (PMI), IPMI, ILMI in CAD as well as EF, Gensini score, BBBs, TVD and mortality in the right ventricle MIs (RVMI). We conducted our study in order to determine prognostic results regarding the affected vein segment in MI which progresses depending on RCA occlusion.

Infarctions that occur due to the interruption of blood flow in RCA are more associated with ST-segment changes in leads I, II, III, aVF and aVL on ECG. ST-segment elevation in lead III derivation is higher than the ST-segment elevation in lead II in RCA occlusion. It is stated that the probability of a lesion in RCA increases significantly when ST-segment depression in aVL derivation is higher than ST-segment in lead I in addition to these criteria (9-11).

Seventy-seven point four percent (n=164) of our patients were male, 22.6% (n=48) were female and the mean age was 64 years.

Male gender is considered as an independent risk factor in several studies. Sixty percent of CADs are seen in male individuals. Atherosclerotic heart diseases start 10-20 years earlier in male individuals and its frequency is 3-6 times higher than in female individuals (6). Our study is consistent with the literature in this aspect.

Wellens et al. (12) have stated that AIMI occurs due to a sudden interruption of blood flow of myocardium fed by RCA or Cx. RCA lesions are the major cause in AIMIs. RCA extends into the right atrium and ventricle and reaches the septum; it then transmits blood into the posterior and inferior part of the left ventricle and ends. Structures such as sinus node regulate the cardiac rhythm and they are mostly supplied by RCA. RCA is dominant in 60-70% of people. Our study was similar to the available studies and the occluded major vein was RCA. The presence of RCA lesions in inferior, posterior and IPMI was 64.9%, 50% and 48.1%, respectively. RCA lesion was also seen in ILMI with an equal rate of 31% with R4. RVMI was observed in two cases, one of which was RCA and the other of which was R5.

Gül et al. (13) stated that the lesion was mostly in RCA in cases with concurrent AIMI and right ventricle infarction. RCA lesions cause the most cases of AIMIs where infarction spreads to the right ventricle and posterior regions. Cx remains at the forefront in cases with only posterior wall infarction accompanying inferior infarction. ECG was used for diagnosis in our study. STEMI in ECG was divided into groups as inferior, posterior, right ventricle, inferoposterior and inferolateral MI. The structure of the occluded major vein was determined based on the occlusion in angiography. AIMI, posterior and inferoposterior MIs were seen in R2 and R3, particularly RCA; inferolateral MIs were detected more in R4, R5 and Cx in our study. It was seen that complications, TV CAD, and mortality increased when involvement extended towards Cx. Therefore, we detected that GS that indicates the frequency of CAD increased, EF decreased and prognosis worsened.

Table 1. Baseline characteristics of study patients

	All patients	Patients with					p
		R1	R2	R3	R4	R5	
Baseline characteristics							
Age, mean ± SD, years	64.56±8.87	62.55±9.10	61.46±9.84	63.1±7.46	70.4±5.61	69.4±5.06	**0.001**
Gender, Male/Female	164/48	105/13	17/7	6/4	20/15	16/9	**0.001**
Laboratory findings							
TG (mg/dL)	151.91±70.06	159.78±77.64	148.33±56.32	136.9±46.44	143.11±67.2	136.48±52.37	0.440
CHOL (mg/dL)	198.48±72.54	197.34±67.85	210.54±79.96	230.1±112.17	201.76±76.83	174.88±58.72	0.257
HDL (mg/dL)	35.60±7.98	34.90±7.81	35.79±8.05	32.6±7.9	36.85±7.48	38.16±9.06	0.218
LDL (mg/dL)	122.20±81.01	128.22±102.00	104.16±36.56	135.2±56.15	122.97±42.5	104.8±32.47	0.519
VLDL (mg/dL)	33.19±18.45	33.91±17.51	29.29±11.00	35.8±19.71	35.02±25.58	29.88±16.53	0.630
LVEF (%)	46.78±14.27	50.77±11.21	50.91±10.99	45.00±12.24	37.45±12.94	36.88±13.04	**0.001**
GS	67.45±50.32	53.16±44.96	74.33±57.85	91.2±56.93	86.82±50.31	91.68±44.23	**0.001**
cTn 1 (ng/mL)	3.08±3.43	2.71±1.79	2.46±1.91	2.82±3.06	3.61±3.37	4.74±7.7	**0.001**
cTn 2	8.06±9.72	7.10±6.24	6.55±4.98	9.48±.25	8.88±8.74	12.36±21.02	**0.008**
cTn 3	18.21±16.21	16.71±13.78	17.94±14.37	19.61±15.98	20.44±20.29	21.86±22.29	**0.001**
Glucose (mg/dL)	139.60±62.99	133.07±51.69	155.25±87.44	193.6±119.17	137.42±60.35	136.84±48.59	**0.036**
BPV (%)	83.96±14.37	79.46±14.59	78.79±15.65	85.80±11.48	94.2±6.21	95.12±5.23	**0.001**
Mortality	34	13	2	2	10	**7**	**0.038**
TVD	111	**44**	**15**	**7**	**24**	**21**	**0.001**
Inferior MI	131	85	18	3	13	12	
Posterior MI	14	7	2	0	4	1	
Inferoposterior MI	27	13	1	4	6	3	**0.004**
Inferolateral MI	38	12	3	3	12	8	
Right ventricular MI	2	1	**0**	**0**	**0**	**1**	

R1: Proximal right coronary artery, R2: Right ventricular branch, R3: Acute marginal artery, R4: Posterolateral branch, R5: Posterior descending artery, SD: Standard deviation, TG: Triglycerides, CHOL: Cholesterol, HDL: High-density lipoprotein, LDL: Low-density lipoprotein, VLDL: Very-low-density lipoprotein, LVEF: Left ventricular ejection fraction, GS: Gensini score, cTn: Troponin, BVP: Blocked vessel percentage, TVD: Three-vessel disease, MI: Myocardial infarction, $p<0.05$

Table 2. Comparison of variables according to the underlying major vessel structure

Right coronary artery								
		R1 n (%)	R2 n (%)	R3 n (%)	R4 n (%)	R5 n (%)	χ^2	p-value
Complication	No	54 (45.8)	14 (58.3)	2 (20)	8 (22.9)	7 (28)	63.75	0.001
	IHF	37 (31.4)	5 (20.8)	2 (20)	3 (8.6)	5 (20)		
	VT	2 (1.7)	0 (0)	0 (0)	5 (14.3)	3 (12)		
	CT/E	7 (5.9)	3 (12.5)	0 (0)	4 (11.4)	1 (4)		
	AV Blocs	13 (11)	1 (4.2)	4 (40)	5 (14.3)	1 (4)		
	APE	5 (4.2)	1 (4.2)	2 (20)	10 (28.6)	8 (32)		
Mortality	No	105 (89)	22 (91.7)	8 (80)	25 (71.4)	18 (72)	10.12	0.038
	Yes	13 (11)	2 (8.3)	2 (20)	10 (28.6)	7 (28)		
BB	No	79 (66.9)	17 (70.8)	5 (50)	21 (60)	17 (68)	22.47	0.004
	RBBB	32 (27.1)	6 (25)	3 (30)	19 (54.3)	2 (8)		
	LBBB	7 (5.9)	1 (4.2)	2 (20)	16 (45.7)	6 (24)		
AF	No	97 (82.2)	16 (66.7)	8 (80)	11 (31.4)	18 (72)	12.40	0.016
	Yes	21 (17.8)	8 (33.3)	2 (20)	24 (68.6)	7 (28)		
TVD	No	74 (62.7)	9 (37.5)	3 (30)	4 (11.4)	4 (16)	26.70	0.001
	Yes	44 (37.3)	15 (62.5)	7 (70)	31 (88.6)	21 (84)		
HT	No	45 (38.1)	10 (41.7)	3 (30)	18 (51.4)	1 (4)	19.17	0.001
	Yes	73 (61.9)	14 (58.3)	7 (70)	31 (88.6)	24 (96)		
DM	No	66 (55.9)	13 (54.3)	3 (30)	18 (51.4)	14 (56)	2.62	0.623
	Yes	52 (44.1)	11 (45.2)	7 (70)	17 (48.6)	11 (44)		
Tobacco	No	46 (39)	10 (41.7)	5 (50)	27 (77.1)	19 (76)	23.45	0.001
	Yes	72 (61)	14 (58.3)	5 (50)	8 (22.9)	6 (24)		
Gender	No	13 (11)	7 (29.2)	4 (40)	15 (42.9)	9 (36)	22.12	0.001
	Yes	105 (89)	17 (70.8)	6 (60)	20 (57.1)	16 (64)		

IHF: Ischemic heart failure, VT: Ventricular tachycardia, CT/E: Cardiac tamponade/effusion, AV: Atriventricular, APE: Acute pulmonary edema, RBBB: Right branch block, LBBB: Left branch block, BB: Branch block, AF: Atrial fibrillation, HT: Hypertension, DM: Diabetes mellitus, %: percent, χ^2: Chi-square, $p<0.05$

In addition to the diagnosis of CAD, cTns are valuable in determining prognosis and planning treatment. Çelebi et al. (14) stated that cTns were highly sensitive and specific indicators of damage in the myocardium. CAPTURE study reported that the risk of 6-month MI with or without death was 23.9% in patients with cTn-T level >0.1 g/L and 7.5% in patients with cTn-T level <0.1 g/L (15). Moreover, approximately 50% of patients with heart failure may have high levels of cTn during both acute and chronic compensation period (16-18). In our study, among the cTn values taken within the first 12 hours, cTn-1 was 3.08±3.43 mg/dL, cTn-2 was 8.06±9.72 mg/dL and cTn-3 was 18.21±16.29 mg/dL. The high levels of cTn values on admission were prognostic in terms of mortality. Moreover, high levels of cTn values increased the frequency of CAD based on the size of the ischemic region as well as the percentage and number of the occluded vein. Thus; decrease in EF is associated with GS, accompanying TVD and increased mortality. cTn correlation was towards negative analysis. cTns provide important information about both the diagnosis and the course of treatment. High cTn level is an important indicator of coronary ischemia, but it should be considered that cTn may increase in different clinical cases and should not be always interpreted in favor of coronary ischemia.

Gensini scoring system of Quadros et al. (19) is a method used in the evaluation of CAD frequency. GS, which is examined with regard to CAD frequency and lesion severity, is a quantitative numerical method when used in conjunction with the analysis conducted through simple catheter calibration that reveals this relationship. While patients with GS below 20 are classified as mild CAD, patients with GS ≥20 are classified as severe CAD (8,20). Gensini score was used in our study for this purpose. A significant difference was detected when the GS and its EFs were compared based on the types of acute MI. It was seen that the more the number of the involved coronary arteries, the more GS increased as well as that EF significantly decreased in association with the increased score based on the involved heart region. Gensini

Table 3. Comparison of variables according to gender

		Female n (%)	Male n (%)	χ^2	p-value
Complication	**No**	9 (18.8)	76 (46.3)	**17.01**	**0.004**
	IHF	14 (29.2)	38 (23.2)		
	VT	4 (8.3)	6 (3.7)		
	CT/E	3 (6.3)	12 (7.3)		
	AV blocs	11 (22.9)	13 (7.9)		
	APE	7 (14.6)	19 (11.6)		
Mortality	**No**	33 (68.8)	145 (88.4)	**10.66**	**0.001**
	Yes	15 (31.3)	19 (11.6)		
BB	**No**	29 (60.4)	110 (67.1)	**10.06**	**0.007**
	RBBB	7 (14.6)	40 (24.4)		
	LBBB	12 (25)	14 (8.5)		
AF	**No**	28 (58.3)	130 (79.3)	**8.57**	**0.003**
	Yes	20 (41.7)	34 (20.7)		
TVD	**No**	3 (6.3)	98 (59.8)	**42.62**	**0.001**
	Yes	45 (93.8)	66 (40.2)		
HT	**No**	7 (14.6)	56 (34.1)	**6.80**	**0.009**
	Yes	41 (85.4)	108 (65.9)		
DM	**No**	34 (70.8)	80 (48.8)	**7.26**	**0.007**
	Yes	14 (29.2)	84 (51.2)		
Tobacco	**No**	37 (77.1)	70 (42.7)	**17.57**	**0.001**
	Yes	11 (22.9)	94 (57.3)		

IHF: Ischemic heart failure, VT: Ventricular tachycardia, CT/E: Cardiac tamponade/effusion, AV: Atrioventricular, APE: Acute pulmonary edema, RBBB: Right branch block, LBBB: Left branch block, BB: Branch block, AF: Atrial fibrillation, HT: Hypertension, DM: Diabetes mellitus, %: percent, χ^2: Chi-square, $p<0.05$

score did not increase in AMI, was highest in bundle branches of RCA, and the highest increase was in R4 bundle branch. It is considered that higher levels of GS in posterior and lateral are associated with Cx.

When the literature is examined, it is seen that several studies have been carried out on BBBs. To the best of our knowledge, no analysis based on the bundle branches of RCA has been conducted as in our study. Right BBB was seen most frequently in distal RCA (R3) at a rate of 30% and left BBB was detected in the posterolateral bundle branch of RCA (R4) at a rate of 28.6%. Braunwald et al. (21) stated that new-onset right BBB led to an increase in cardiovascular mortality due to frequent prevalence of CAD and IHF. When RBBB occurs in presence of cardiac the disease, it causes disease to progress. Braunwald et al. (22) stated that the presence of left BBB caused increased spread of disease, decreased ventricular function and decreased survival among the patients with CAD. In our study, right BBB was more common in men and left BBB was more common in women. In a similar study, Hesse et al. (23) found that right BBB was more common in older men and light BBB was more common in older women. In our study, right BBB was mostly seen in IPMI at a rate of 63% and left BBB was mostly seen in ILMI at a rate of 39.5%. IHF was the most common complication in both right and left BBBs and seen in the proximal shade of RCA. AV complete block was prominent in the middle and distal parts of RCA, and VT and APE were more common when Cx was included or approached laterally. In total, mortality was mostly seen in left BBB at a rate of 46.2%. However, it was interesting that mortality in both BBBs was highest in PDA of RCA. It is likely that it is close to Cx or Cx is included in the process. TVD, GS and mortality increased when TVD proceeded laterally. In case of diabetes and smoking, hypertension, which is one of the risk factors, was more frequently together with left and right BBBs. We think that conditions affecting lungs such as smoking and chronic lung diseases affect ventricle more and cause an increase in right BBB.

Mean EF was 46 in our study. EFs of the patients decreased in inferior MI and to a lesser extent in anterior MI. EFs of the patients with lesions in Cx were affected more based on the data of our study. The greater the rate of occlusion, the greater the mortality and CAD frequency in our study. CAD frequency and EF showed

Table 4. Comparison of variables according to myocardial infarction

Myocardial infarction		IMI n (%)	PMI n (%)	IPMI n (%)	ILMI n (%)	RVMI n (%)	χ^2	p-value
Complication	No	79 (60.3)	1 (7.1)	2 (7.4)	3 (7.9)	0 (0)	36.9	0.001
	IHF	48 (36.6)	1 (7.1)	1 (3.7)	2 (5.3)	0 (0)		
	VT	3 (2.3)	0 (0)	1 (3.7)	6 (15.8)	0 (0)		
	CT/E	0 (0)	12 (85.7)	1 (3.7)	2 (5.3)	0 (0)		
	AV blocs	1 (0.8)	0 (0)	18 (66.7)	5 (13.2)	0 (0)		
	APE	0 (0)	0 (0)	4 (14.8)	20 (52.6)	2 (100)		
Mortality	No	128 (97.7)	11 (78.6)	14 (51.9)	23 (60.5)	2 (100)	55.24	0.001
	Yes	3 (2.3)	3 (21.4)	13 (48.1)	15 (39.5)	0 (0)		
BB	No	101 (77.1)	11 (78.6)	7 (25.9)	18 (47.4)	2 (100)	64.15	0.001
	RBBB	23 (17.6)	2 (14.3)	17 (63)	5 (13.2)	0 (0)		
	LBBB	7 (5.3)	1 (7.1)	3 (11.1)	15 (39.5)	0 (0)		
AF	No	109 (83.2)	9 (64.3)	19 (70.4)	20 (52.6)	0 (0)	16.44	0.002
	Yes	22 (16.8)	5 (35.7)	8 (29.6)	18 (47.4)	0 (0)		
TVD	No	71 (54.2)	8 (57.1)	9 (33.3)	13 (34.2)	0 (0)	9.55	0.049
	Yes	60 (45.8)	6 (42.9)	18 (66.7)	25 (65.8)	2 (100)		
HT	No	52 (39.7)	2 (14.3)	4 (14.8)	5 (13.2)	0 (0)	16.54	0.002
	Yes	79 (60.3)	12 (85.7)	23 (85.2)	33 (86.8)	2 (100)		
DM	No	72 (55)	11 (78.6)	12 (44.4)	18 (47.4)	1 (50)	5.12	0.275
	Yes	59 (45)	3 (21.4)	15 (55.6)	20 (52.6)	1 (50)		
Tobacco	No	52 (39.7)	9 (64.3)	20 (74.1)	25 (65.8)	1 (50)	16.74	0.002
	No	79 (60.3)	5 (35.7)	7 (25.9)	13 (34.2)	1 (50)		
Gender	F	25 (19.1)	3 (21.4)	9 (33.3)	11 (28.9)	0 (0)	4.17	0.384
	M	106 (80.9)	11 (78.6)	18 (66.7)	27 (71.1)	2 (100)		
MBV	R1	85 (64.9)	7 (50)	13 (48.1)	12 (31.6)	1 (50)	35.20	0.004
	R2	18 (13.7)	2 (14.3)	1 (3.7)	3 (7.9)	0 (0)		
	R3	3 (2.3)	0 (0)	4 (14.8)	3 (7.9)	0 (0)		
	R4	13 (9.9)	4 (28.6)	6 (22.2)	12 (31.6)	1 (50)		
	R5	12 (9.2)	1 (7.1)	3 (11.19)	8 (21.1)	1 (50)		

IHF: Ischemic heart failure, VT: Ventricular tachycardia, CT/E: Cardiac tamponade/effusion, APE: Acute pulmonary edema, RBBB: Right branch block, LBBB: Left branch block, BB: Branch block, AF: Atrial fibrillation, HT: Hypertension, DM: Diabetes mellitus, MBV: Major bloced vessel, IMI: Inferior MI, PMI: Posterior MI, IPMI: Infero-posterior MI, ILMI: Infero-lateral MI, RVMI: Right ventricular MI , F: Female, M: Male %: percent, χ^2: Chi-square, $p<0.05$

negative correlation, and the most frequent complication, IHF, increased after AMI. EF was 50.77±11.21 in RCA, 50.91±10.91 in R2, 45±12.24 in R3, 37.45±12.94 in R4, and 36.88±13.04 in R5. As seen in the EF, it was observed that the more the involvement of the heart towards left, the more the decrease in EF. EF was mostly deteriorated in R5. We think that it is caused by the fact that Cx accompanies ILMI. The right ventricle involvement was mostly seen in the proximal RCA. Masci et al. (24) observed that the early damage in the right ventricle was associated with the ischemia occurred in proximal RCA at a higher level than the middle and distal RCA. Rallidis et al. (25) stated that the lesion of proximal RCA affected RV function more than distal RCA. IHF, which is one of the complications occurring after AMI, was mostly in RCA lesions at a rate of 31.4% in our study. Cardiac tamponade and pericardial effusion were detected in middle-RCA. Acute lung edema was most frequently seen in PDA (R5) at a rate of 32%. IHF and lung edema were more common in female individuals at the rates of 29.2% and 14.6%, respectively. Cardiac tamponade and/or pericardial effusion was seen more in male individuals at a rate of 7.3%. The reason for this can be explained through the fact that hypertension and diabetes, which are secondary risk factors, are seen more in female individuals. These two risk

factors were higher in female individuals and smoking status was higher in male individuals in our study.

The occluded major vein was posterolateral bundle branch (R4) at a rate of 28.6% when the mortality analysis was conducted based on bundle branches of RCA. Whereas Lin et al. (26) found that the mortality in RCA lesions was higher than proximal and distal RCA (25.9%, 1.7%, 24.1%, respectively). The mortality rate 31.3% in female individuals and mostly detected in acute IPMI at a rate of 48.1%. Movement disorder in anterior and inferior walls, which were common in our patients with BBBs, and aneurysms in interventricular septum supported the fact that these patients had common vein disease. TVD and mortality were most frequently seen in bundle branches of RCA close to Cx, where GS was high in distal RCA, where EF was low.

The fact that cases with MI which progresses due to RCA occlusion are correlated with the lesion region may be a predictive foresight in order to predict the RCA and its bundle branches, since it gradually increases the complications based on the number of the occluded coronary arteries, TVD and mortality. It may be more important to describe CAD with poor prognosis criteria instead of potentially absolute values.

The biggest limitation of our study was its retrospective nature. Moreover, the difficulty in reaching laboratory results and detection of risk factors through calling patients one by one were other reasons of limitation. We believe that our study may be beneficial if it is supported by new prospective data when the limitation in health expenses in the recent periods of time is taken into consideration.

Conclusion

Early prediction of the occlusion level of RCA and its bundle branches, the cTn-dependent or independent complications after AMI may be a predictive foresight to indicate TVD and mortality prognosis.

Ethics

Ethics Committee Approval: Cumhuriyet University approval number: 2018-01-26.

Informed Consent: Informed consent was obtained.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.C., İ.K., Concept: A.C., Design: A.C., Ş.H.E., Data Collection or Processing: A.C., Analysis or Interpretation: A.C., İ.K., Literature Search: A.C., İ.K., Writing: A.C., Ş.H.E.

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Assessment of Safety Status and Response Capacity of Selected Primary Health Care Hospitals in Bangladesh

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Abstract

Aim: Hospital is an integral part of society. It can play vital role in saving lives during disasters. Bangladesh is a highly disaster-prone country in the world. It is urgent to know the safety status and response capacity of our healthcare facilities to ensure effective, necessary healthcare services during a disaster, safety and security of healthcare providers and patients. Our aim was to assess hospital safety status and response capacity of selected Upazila Health Complexes [primary healthcare hospital (PHH)].

Materials and Methods: The study was conducted at three PHH namely - Savar, Dhamrai and Saturia PHH. Sampling Technique: Purposive sampling technique was used. Healthcare providers and supporting staffs of the selected PHH and the PHH building were the study population of this study. The number of healthcare providers (physicians and nurses) in each PHH was 20. The total number of healthcare providers as study population was 60. The number of supporting staffs in each PHH was 73. The total number of supporting staff as study population was 219. PHH itself was a study population in this study and the total number of PHHs as study population was three. Estimated total number of study population was 282. Data were collected from 110 participants due to resource constraint. Of the 110 participants, 28 were physicians, 26 were nurses and 50 were other staffs. Three hospitals (PHH) were also included as the study population in this study.

Results: Among the three PHH, Savar and Dhamrai were classified as average resilient healthcare facilities on the impacts of the eventual disasters and Saturia PHH was classified as vulnerable healthcare facility on the impacts of the disasters.

Conclusion: Bangladesh has a large population compared to scarce healthcare resources. It is very pertinent to know the hospital safety status and response capacity of the healthcare facilities. Although it was a small-scale study, the results are alarming. This study will help policymakers decide priority-based resource allocations for the hospitals.

Keywords: Hospital safety, disaster, upazila health complex, primary care hospital, response capacity of hospitals

Introduction

Bangladesh is the largest bay island in the world. The country is highly vulnerable to disasters due to its geographical location, population density and climate change effects. Every year, it is ravaged by flood, cyclone, tornadoes, riverbank erosion, drought, road traffic accidents, etc. In the last three decades, the frequency of disaster has increased fivefold (1). Sixty-eight percent of the country is vulnerable to flood. Twenty percent (35.8 million) of the population is under risk for the effects of salinity. In the last three years, Bangladesh loses 10000 hectares per year due to riverbank erosion. Sixty-eight thousand people move each year due to riverbank erosion. Besides this, one of the critical issues is that Bangladesh lies in seismic zones. Bangladesh is under high threat of mega earthquakes due to its geographical location and historical background. All of these factors have raised Bangladesh to 5th place in world risk ranking in 2012 (2). As Bangladesh is highly disaster-prone country, the hospitals are also highly

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vulnerable to disasters. Hospitals are vital institutes that must continue activities during and immediately after disaster events. The health services during and shortly after a disaster are a matter of life and death for the mass population.

It is vital to know details about the capacity of our hospitals to withstand and continuation of services during disasters. In our country, hospital risks regarding structural, non-structural and functional aspects are still unknown. Therefore, it was a contemporary demand to conduct hospital risks assessment (HRA) in Bangladesh. This country has limited resources. By performing an evaluation of hospital risks, it will be possible to know about our hospital's safety status and ability to respond immediately after disaster events. The findings of this study will help policymakers decide primarily on resource allocation on a priority basis to withstand hospitals in disasters. It will save lives. According to the Pan American Health Organization (2015), building hospitals may request up to 70% of the Ministry of Health's budget of a country. For that reason, HRA is also a fundamental issue to ensure efficient use of available resources (3).

Bangladesh Healthcare System Structure

Bangladesh healthcare system is a pluralistic system. This system is broadly divided into three tiers: primary, secondary and tertiary healthcare facilities. Community clinics, union health and family welfare center, union sub-centers and primary healthcare hospitals (PHH) are primary care hospitals. District hospitals are secondary healthcare facilities. Medical college hospitals and specialized care institutes are considered tertiary care facilities (4).

Hospital Safety Index (HSI)

HSI is a rapid and inexpensive tool used in the evaluation of hospitals. It is developed by Pan American Health Organization disaster management experts. It is used to assess the safety of hospitals. It plays a vital role in emergency responses. HSI not only helps in safety status assessment, but also helps in the evaluation of the response capacity of the hospitals. A checklist helps to assess different items and safety ratings of a hospital. A scoring system assigns the relative importance of each item which gives a numeric value to the probability that a hospital can survive and continue to function in an emergency or disaster when calculated. It helps authorities to determine which hospitals need urgent actions to improve safety and functionality (5).

Objectives of the Study

General Objective: To assess hospital safety status and response capacity of selected Upazila healthcare complexes (sub-district hospitals).

Specific Objectives: i. To evaluate hospital risk assessment of structural components. **ii**. To assess hospital risk assessment of non-structural elements. **iii**. To determine HRA of functional components. **iv**. To evaluate hospital evacuation plan in case of emergency. **v**. To establish the hospital incident command system.

Materials and Methods

Study Place

The study was conducted at three Upazila Healthcare Complexes - Namely Savar, Dhamrai and Saturia PHH.

Sampling Technique

Purposive sampling technique used.

Sample Size

Healthcare providers and supporting staffs of the selected PHH and the PHH building were the study population of this study. The number of healthcare providers (physicians and nurses) in each PHH was 20 and the total number of healthcare providers as study population was 60. The number of supporting staffs in each PHH was 73 and the total number of supporting staff as study population was 219. PHH itself was a study population in this study and the total number of PHHs as study population was three. Estimated total number of study population was 282. Data were collected from 110 participants due to resource constraint. Of the 110 participants, 28 were physicians, 26 were nurses and 50 were other staffs. Three hospitals (PHH) were also included as the study population in this study.

Data Collection, Management, and Analysis

Data were collected using a mixed-type questionnaire, safe hospital checklist and document review. Researchers also conducted HRA by using "safe hospital checklist" (6). The data collection period was from the fourth week of August 2017 to the third week of September 2017. The safety assessment included three components covering structural, non-structural and functional capacity. To analyze the data, the safety status of each item was categorized into three levels: not safe, average safe and highly safe. The researchers assigned scores of 0, 1 and 2 to each category, respectively. Equal weight was given to all safety components and corresponding elements. A raw score was tallied by a simple sum of all the item scores. Finally, all scores were normalized on a 100-point scale. To ease interpretation, all scores were rounded to the nearest number. Hospitals were classified into three safety classes according to the normalized total scores as follows: low (<33.0), average (34.01-66.0) and high (>66.0).

Data Analysis: After collecting and clearing the data, analysis was done by using the Statistical Package of Social Science [(SPSS) IBM, Armonk, NY, United States of America] software version 22.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board of National Institute of Preventive and Social Medicine (Memo No: NIPSOM/IRB/2017/231 Date: 08-23-2017).

Results

In this study Savar PHH was classified as "B" category health facility according to HSI. The average structural safety of Savar PHH was 50%, the average non-structural safety of Savar PHH was 36%, and functional safety of this PHH was 12%. Dhamrai PHH was classified as "B" category health facility according to HSI. The average structural safety of Dhamrai PHH was 51%, average non-structural safety of Dhamrai PHH was 38%, and average functional safety of this PHH was 12%. The results denoted that Savar and Dhamrai PHH have average resilience capacity following a disaster event. Saturia PHH was classified as "C" category health facility according to HSI. The average structural safety of Saturia PHH was 35%, average non-structural safety of Saturia PHH was 36%, and functional safety of this PHH was 0.0%. The safety indices of all PHHs are shown in Figure 1 (Table 1). This meant that Saturia PHH had a low resilience capacity following disasters and it was more vulnerable to disasters than others. In this study, the average structural safety score was 45%, average non-structural safety score was 37%, and the average functional safety score was 8%. The vulnerability indices of all PHHs are shown in Figure 2 (Table 2).

Despite having data using HSI, hospital staffs were interviewed by using a semi-structured questionnaire. One hundred and seven responses were collected from participants on different aspects of HRA. Seventy respondents (65.4%) stated that "Hospital Risk Assessment" was necessary for safety and security concern of health service providers and patients. Thirty respondents (28%) indicated that HRA was essential for effective service delivery during a disaster. Eighteen respondents (16.8%) stated that HRA was necessary for emergency preparedness.

Regarding the capacity of the Upazila health complexes to assess HRA, 41 respondents (38.3%) stated that PHH authority has medium capacity. Twenty-one respondents (19.6%) stated that authority had a low capacity. Thirty-eight respondents (35.5%) stated that they did not see any activity regarding HRA in the current work period. Two respondents (1.9%) stated that authority had a high level of HRA capacity. One respondent did not answer. One hundred respondents (93.5%) stated that "lack of manpower" was one of the barriers in HRA. Twenty-three respondents (21.5%) stated that "lack of logistics" was a significant barrier in HRA.

"Lack of financial resources" was identified by eight respondents (7.5%). Lack of training, lack of awareness and lack of maintenance were also identified as barriers by 15 (14%) respondents. Fifty-four respondents (50.5%) stated that "structural integrity" was a priority area in HRA. Sixty-four respondents (59.8%) stated "safety

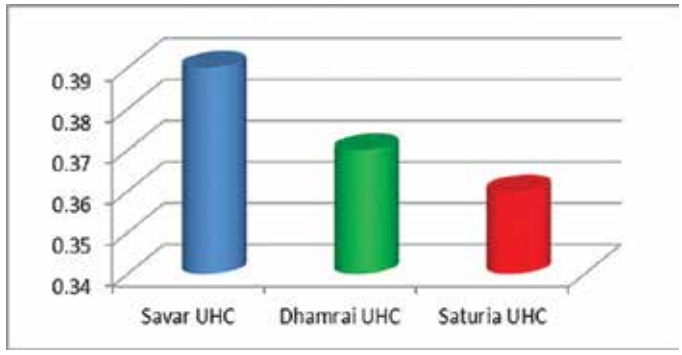

Figure 1. Safety indices of Savar, Dhamrai and Saturia primary healthcare hospital

Table 1. Safety indices of Savar, Dhamrai and Saturia primary healthcare hospitals

Savar PHH=0.39	Health facility status: "B" category
Dhamrai PHH=0.37	Health facility status: "B" category
Saturia PHH=0.36	Health facility status: "C" category

Note: Calculation done by using hospital safety index calculator (7)
PHH: Primary healthcare hospital

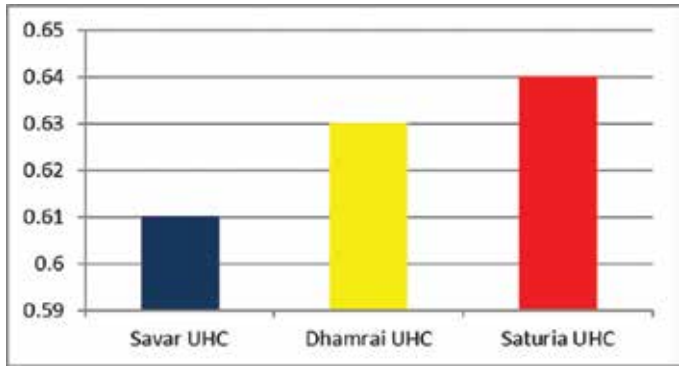

Figure 2. Vulnerability index of Savar, Dhamrai and Saturia primary healthcare hospital

Table 2. Vulnerability indices of Savar, Dhamrai and Saturia primary healthcare hospitals

Savar PHH Hospital	0.61
Dhamrai PHH	0.63
Saturia PHH	0.64

Note: Calculation done by using hospital safety index calculator (7)
PHH: Primary healthcare hospital

and security" as priority areas in HRA. Eighteen respondents (16.8%) stated "ensure logistics" as a priority area in HRA. Ninety-four respondents (87.9%) recommended "training" regarding HRA. Thirty respondents (28%) recommended "adequate supply of manpower", nine (8.4%) recommended "adequate financial resources", 11 (10.3%) recommended "ensure adequate logistics", two (1.9%) recommended "proper maintenance of PHH building", and seven (6.5%) recommended fire protection system, regular disaster management mock drill, rapid, flexible notification.

Discussion

As "HSI" is a readily applicable, simple tool to assess hospital preparedness, many countries are using this tool in large scale. In Moldova, all government hospitals have been evaluated using HSI. Of the 61 public hospitals being assessed, 24.6% (n=15) hospitals were classified as group A hospitals – indicative of these hospitals has relative high degree of resilience to the impact of eventual disasters. 41 hospitals (67.2%) were classified as group B - indicative of an average degree of resilience to the effects of consequent disasters. Five hospitals (8.2%) were classified as group C hospitals. That denotes that these hospitals are vulnerable to the impacts of the disasters (8,9).

HSI of 421 Iranian hospitals was assessed in 2015. Eighty-two hospitals (19.4%) were classified as not safe hospitals. Considering resilience to the impacts of disasters, 339 hospitals (80.6%) were ranked as average secure hospital. There was no hospital in the high safety category (10,11). In Bangladesh, Asian Disaster Preparedness Center conducted HRA recently. The study was a city-based study. The researchers of the study reported HRA draft results. Results of HRA showed that among 16 hospitals, six scored "B" and ten scored "C" in terms of the overall safety index calculated for the structural, nonstructural and functional components of the hospitals by 151 HSI indicators (12).

In this study, two PHHs, namely Savar and Dhamrai PHH, were classified as "category B" health facility considering their resilience to the impacts of disasters. This denotes that these two hospitals are basic safety facilities considering resilience to inevitable disasters. The remaining one, namely Saturia PHH, was classified as "category C" health facility considering its resilience to the impacts of disasters. This denotes that Saturia PHH is vulnerable to eventual impacts of disasters. In our current study, average structural safety score was 45%, average non-structural safety score was 37% and the average functional safety score was 8%. In Iranian research, the average safety score of functional capacity was 41.0%, the average safety score of the non- structural component was 47.0% and the average safety score of structural safety was 42.0%.

The method for "adapting HSI" to Iranian context was performed by a multidisciplinary group of experts from disaster management, medical sciences, architecture, and engineering field. The adaptation process also included translation into the Farsi language, field-testing, face and content validation, and developing an analysis plan (10,11). In this study, the methods for adapting the "HSI" were performed by disaster management expert. The adaptation process also included field-testing, content validation, and developing an analysis plan.

According to the FHSI guideline in the Islamic Republic of Iran, hospital disaster committees are responsible for assessment coordination, data collection, and data entry in the "Ministry of Health and Medical Education" Portal System. The assessment team have three to five members including physicians, nurses, technicians or engineers from the hospital maintenance office. Self-assessment was the primary approach for data collection (10,11). In the current study, there was only one "Hospital Disaster Management Committee" in Savar PHH and data were collected from that committee. In our other two hospitals, there was no "Hospital Disaster Management Committee". In this case, our researchers assessed the HSI by using a safe hospital checklist. In the Iranian research, researchers analyzed the FHSI data that were available on the "Ministry of Health and Medical Education" portal system and that hospital was affiliated to the Ministry of Health and Medical Education (10,11). In this study, all study hospitals were affiliated with "Ministry of Health and Family Welfare". But there was no data regarding HRA in "Ministry of Health and Family Welfare" portal system.

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Ethics

Ethics Committee Approval: Ethical approval had been taken from the Institutional Review Board of National Institute of Preventive and Social Medicine (Memo no: NIPSOM/IRB/2017/231 Date: 08-23-2017).

Informed Consent: N/A.

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Surgical and Medical Practices: M.E.M., B.K.R., M.Z.I., M.H., Concept: M.E.M., B.K.R., Design: M.E.M., B.K.R., M.Z.I., M.H., Data Collection or Processing: M.E.M., B.K.R., M.Z.I., M.H.,

Analysis or Interpretation: M.E.M., B.K.R., Z.I., M.H., Literature Search: M.E.M., B.K.R., M.H., Writing: M.E.M., B.K.R., M.H.

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Knowledge and Skills of the Senior Students of Paramedical, Nursing and Medical Faculties on Cardiopulmonary Arrest Recognition, Maintenance of Chest Compression and Ventilation

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Abstract

Aim: We believe that automatic external defibrillators are not common in our country and aimed to compare the knowledge and skills of senior students in paramedical, nursing and medical faculties on recognizing cardiopulmonary arrest (CPA) case, providing proper chest compression and maintenance of ventilation as well as evaluating cardiopulmonary resuscitation (CPR) cycle one month before starting profession.

Materials and Methods: Fifty senior students from paramedic department, 50 senior students from nursing department and 50 senior students from medical school were included in the study. The participants were asked 10 theoretical questions to evaluate their basic resuscitation knowledge. Each participant was then asked to intervene in a suspicious CPA case using Prestan Adult CPR Manikin alone in a separate room.

Results: The highest rate of correct answers given to theoretical questions related to CPR was in paramedic students with a mean score of 7.34±1.99 points among the students of these three departments (p=0.001). The mean scores of both theoretical and practical application of paramedic students were found to be significantly higher than the students of the nursing and medical faculties, when all three groups were compared with each other with regard to their mean success scores of theoretical and practical applications.

Conclusion: In our study, the mean scores of both theoretical and practical application of paramedic students were found to be significantly higher than the other groups.

Keywords: Chest compress, medical students, cardiopulmonary arrest, cardiopulmonary resuscitation

Introduction

While cardiopulmonary arrest (CPA) describes the cease of breathing and circulatory functions, cardiopulmonary resuscitation (CPR) defines all of the practices that are carried out in order to ensure spontaneous breathing and circulation. Responding to CPA victims is an ethical and legal obligation for health professionals. However, some studies have been carried out to reveal the lack of knowledge and skills related to the CPR of health professionals (1,2). Effective chest compression is a critical intervention that affects post-CPA outcomes (3). It is indisputable that CPR practices that are properly carried out have positive effects on mortality and morbidity (4). Recognizing CPA, which is one of the application steps of Basic Life Support, and

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rapid initiation of manual chest compression have become more important especially in out-of-hospital CPA cases in countries where automatic external defibrillator (AED) is not common.

We considered that AEDs are not common in our country and aimed to compare the knowledge and skills of senior students in paramedical, nursing and medical faculties on recognizing CPA, providing proper chest compression and maintenance of ventilation as well as evaluating CPR cycle one month before starting profession in our study. Our study is based on the practices of European Resuscitation Committee (ERC).

Materials and Methods

Ethics committee approval was obtained from Hasan Kalyoncu University and the study was conducted between 1-31 May in Paramedic Department of Vocational School of Hasan Kalyoncu University, Nursing Department of Vocational School of Hasan Kalyoncu University and Faculty of Medicine of Gaziantep University.

Fifty senior students from paramedic department, 50 senior students from nursing department and 50 senior students from faculty of medicine who volunteered and who were entitled to graduate after one month were included in the study. The participants were selected from the beginning of the list of schools and all participants did not receive simulation training before. Written consent was obtained from all participants. After the participants were informed about the study, 10 theoretical questions were asked to evaluate their basic resuscitation knowledge. Each participant was then asked to intervene in a suspicious CPA case using Prestan Adult CPR Manikin alone in a separate room. The applications carried out were recorded in accordance with the sequence of actions on forms that had been prepared before and where totally 10 intervention steps had been correctly and incorrectly ticked off. The evaluation of the accuracy and inaccuracy of application steps was based on the indicator system in the practice model. Each participant was given a total of five minutes for practical applications. Theoretical and practical applications were evaluated over a total of 10 points.

Response steps were as follows: 1) Recognizing CPA was grouped as steps number 1-5, 2) Correct form of maintenance of circulation and ventilation was grouped as steps number 6-8, 3) Evaluation of five cycles of CPR consisting of 30 compressions and two ventilations for two minutes through pulse check was grouped as steps number 9-10, and they were evaluated. After completing the practical applications, the participant was taken into a separate room and was able to talk to other practitioners during the application.

The exclusion criteria were as follows: participants studying in the middle grade classes of the mentioned university, participants who did not qualify to graduate one month after the start of the study, and participants who previously performed CPR application before the study.

Statistical Analysis

The normality of the data was tested statistically by Shapiro-Wilk test. Student's t-test was used to compare the data with normal distribution between two independent groups. Comparisons between multiple independent groups were conducted through ANOVA test. Multiple comparisons of the groups that were different in the ANOVA test were conducted through LSD test. Descriptive statistical methods were presented as number and percentage for categorical variables and as mean ± standard deviation for quantitative variables. SPSS for Windows version 13 was used for statistical analysis.

Results

The mean age of the students was 22.91±2.98 (range, 19-35) years. Of the participants, 55.3% (n=83) were female and 44.7% (n=67) were male. The mean score of the correct answers to theoretical questions was 6.29±2.3 (range, 0-10) and practical application was 5.63±2.82 (range, 0-10).

The highest rate of correct answers for theoretical questions related to CPR was in paramedic students with a mean score of 7.34±1.99 among the students of these three departments. Moreover, this group was the most successful group in application steps with a mean score of 6.54±2.14. The relationship between theoretical and practical application scores of paramedic students was consistent with each other and no statistically significant difference was found (p=0.056). The scores and statistical relationships between the success scores of theoretical and practical applications of students in nursing department and faculty of medicine are presented in Table 1. A statistically significant difference was found between the theoretical success scores of students in nursing department and faculty of medicine and their application scores ($p<0.05$). Accordingly, the rate of these scores was significantly higher than the rate of skills to practice theoretical information of both groups in them.

The mean scores of both theoretical and practical applications of paramedic students were found to be statistically and significantly higher than the students in nursing department and faculty of medicine when three groups were compared with each other with regard to their mean success scores of theoretical and practical applications (p=0.001) (Table 1).

Steps 1-5 were correctly performed by paramedic students at the highest level (p=0.001). The practitioners were expected

to perform two ventilations against 30 compressions for two minutes within the steps 6-8 where the circulation was expected to be correctly maintained. They were asked to position palms correctly, interlock the fingers of both hands, not to bend the arms from elbows, to get support from the shoulders, and to apply chest compression. Practitioners were expected to press the sternum 5-6 cm down and allow chest wall to raise again. Medical students were found to be more successful in this step (p=0.001). Paramedic students showed more significant application success than the other groups in the steps 9-10, including evaluation of CPR cycle through pulse check which was performed at the end of a cycle (p=0.001) (Table 2).

All groups correctly answered the questions "What should be the compression/ventilation ratio in an adult CPA case?" and "Which of the following is the infant group in Basic Life Support applications?". Both questions were answered correctly by 136 (90.7%) students. The most incorrectly answered question by all groups was "What should be the compression/ventilation ratio in a pediatric CPA case?" and it was answered incorrectly by 109 participants (72.7%) (Table 3).

The most accurately performed step by all groups (n=135, 90%) was "Step 6: 30 Chest Compression-2 Ventilation in Adult Case with CPR". The most inaccurately performed step by all participants was Step 8. It was expected from the participants to

Table 1. Relationship between theoretical knowledge and practical application

	n	Theoretical average	Application average	p
Paramedic students	50	7.34±1.9	6.54±2.1	(p=0.001)*
Nursing department	50	3.68±1.6	2.8±2	
Faculty of medicine	50	6.12±1.4	5.1±2.5	
Total	150	5.71±2.2	4.8±2.7	

*Significant at <0.05 level

Table 2. Application success

Application groups	Participant student groups	Mean	p
CPA recognition	Paramedic (n=50)	0.74±0.29	**(p=0.001)***
	Nursing (n=50)	0.30±0.27	
	Medicine (n=50)	0.56±0.28	
	Total (n=150)	0.53±0.33	
The correct form of maintenance of circulation	Paramedic (n=50)	0.49±0.28	**(p=0.001)***
	Nursing (n=50)	0.32±0.24	
	Medicine (n=50)	0.50±0.28	
	Total (n=150)	0.44±0.28	
Evaluation of cycle (every 2 minutes)	Paramedic (n=50)	0.68±0.42	**(p=0.001)***
	Nursing (n=50)	0.20±0.36	
	Medicine (n=50)	0.38±0.44	
	Total (n=150)	0.42±0.45	

*Significant at <0.05 level
CPA: Cardiopulmonary arrest

Table 3. Theoretical step evaluation

Theoretical question		Number (n)	Rate (%)
1. How many cm does the sternum collapse? during chest compression?	False	38	25.3
	True	112	74.7
2. During CPR, how many minutes is ventilation applied to the patient with CPA?	False	99	66.0
	True	51	34.0
3.What should be the ratio of compression/ventilation in case of an adult patient with CPA?	False	14	9.3
	True	136	90.7
4. How many rescue ventilations are applied to the pediatric patient in CPA case per minute?	False	69	46.0
	True	81	54.0
5. What should be the ratio of compression/ventilation in case of a pediatric patient with CPA?	False	109	72.7
	True	41	27.3
6. Which of the following is infant group in Basic Life Support applications?	False	14	9.3
	True	136	90.7
7. How many ventilations are applied to infant patients in CPA case per minute?	False	65	43.3
	True	85	56.7
8. How should be the chest compression in case of infant patient with CPA?	False	57	38.0
	True	93	62.0
9. What would you do if you did not observe ventilation and circulation at the end of the firs cycle?	False	84	56.0
	True	66	44.0
10. From which region is pulse checked in an adult and infant patient?	False	94	62.7
	True	56	37.3

CPA: Cardiopulmonary arrest

compress the sternum 5-6 cm down during chest compression; but 79.3% (n=119) of them performed the application in an incorrect way (Table 4).

Discussion

CPR knowledge is an important determinant in the success of resuscitation and plays a vital role in the absolute outcomes of acute and emergency cases (5). Standardization of CPR knowledge is a scientific obligatory for all institutions providing education of health sciences as well as a factor reducing mortality in CPA cases. The success rate related to the overall CPR knowledge of students in Faculty of Medicine, Nursing Department and Paramedical Department vary in the studies where they were both comparatively and individually evaluated in the literature (6-8). It can be stated that the level of theoretical knowledge of all groups is low when the evaluation is conducted by considering the pre-test results of these studies (1,7,9). In certain studies where CPR knowledge and skills of paramedics were compared with students of Faculty of Medicine and other health professionals, it was stated that they were more successful consistent with our study (6,10,11). Paramedic students were more successful in both theoretical questions and application steps, and there was a significant relationship between their theoretical and application scores in our study. We think that this is based on the fact that the basic subject of paramedic education is CPR and that paramedics especially focus on this subject.

There are studies in the literature reporting the fact that pediatric CPR knowledge is less than adult CPR knowledge and that health professionals are more diffident in this matter (12). There are studies revealing that knowledge and skills related to the pediatric CPR of both students in medical and health science areas and health professionals who work in pre-hospital areas and units of hospitals are insufficient (1,12,13). It has been indicated that only 19% of Pediatricians have theoretical and practical competence in a study (14). In our study, many of the participants were able to theoretically recognize CPA cases; however, they had not sufficient theoretical knowledge related to the compression/ventilation ratio. It can be postulated that this arises from the fact that CPR trainings are usually provided for the adult cases and on adult models, because adult CPA happens more frequently in daily practices.

Table 4. Application step evaluation

	Conclusion	Number (n)	Rate (%)
Step 1: The patient is held by her/his shoulder and shaken to evaluate the state of consciousness	True	60	40.0
	False	90	60.0
Step 2: Please loudly ask "How are you?"	True	62	41.3
	False	88	58.7
Step 3: If she/he does not answer. Please call for help	True	80	53.3
	False	70	46.7
Step 4: Please check the inner part of the mouth. Foreign body? Airway maneuver should be done	True	86	57.3
	False	64	42.7
Step 5: Please evaluate whether she/he breaths or not through "Look. Listen. Feel" method. Pulse check - Carotid Please do not spend more than 10 seconds for these steps	True	61	40.7
	False	89	59.3
Step 6: 30 Chest Compression-2 Ventilation in Adult with CPR	True	135	90.0
	False	15	10.0
Step 7: 100-120/min of compression palms are correctly placed. fingers of both hands are interlocked, arms are not bended by elbows and propped up from the shoulder and chest compression is applied	True	118	78.7
	False	32	21.3
Step 8: Sternum is sunken 5-6 cm down	True	119	79.3
	False	31	20.7
Step 9: Evaluation is carried out every 5 cycles	True	89	59.3
	False	61	40.7
Step 10: Pulse is checked from the Carotid Artery for 5 seconds. CPR is maintained, if there is no pulse (30 Chest compressions/2 ventilations) Breathing is checked, if there is pulse If there is no pulse. breathing is applied as 12 times / min. (one ventilation in every 5 sec.)	True	85	56.7
Airway maneuver is maintained, if there is pulse	False	65	43.3

Cardiopulmonary arrest recognition: Steps number 1-5, The Correct way of maintenance of circulation: Steps number 6-8, CPR cycle evaluation through pulse check: Steps number 9-10.

CPR: Cardiopulmonary resuscitation

In accordance with our study, ventilation/chest compression ratio in different age groups was correctly known at higher levels in a study conducted on students of nursing department (1). However, in a study comparing senior students of Faculty of Medicine and Dentistry, 27% of the participants in both groups incorrectly knew the 30/2-application rate of ventilation and chest compression in adults (5). There are several studies indicating that both students of health sciences and health professionals cannot successfully perform the application of compressing the sternum down to a sufficient depth in order for applying proper chest compression in the literature (10,15,16). Although 74.7% (n=112) of the participants correctly answered the theoretical question related to the depth where the sternum is compressed down during chest compression, 79.3% (n=119) of them failed in performing this application in our study. We think that this is due to a lack of in practical application.

CPR application begins with recognizing the patient with CPA. All health professionals are expected to quickly and properly recognize CPA case, unlike the rescuer from the public. There are studies indicating that all healthcare professional groups and students of health sciences have difficulty in recognizing CPA (2,15). Less than half of the participants correctly answered the questions related to recognizing arrest, but it was seen that paramedic students were more successful in steps of recognizing CPA than the other groups in our study.

For CPR applications where circulation is properly maintained, compression should be applied to the correct region manually, in correct number and at correct depth. It was indicated that as the number of chest compression increased, quality of compression decreased and sufficient depth of sternum collapse could not be achieved (17). It was seen that the participants usually applied the compression and ventilation ratio properly, but they could not sufficiently compress the sternum down in the studies conducted. This is not an important shortcoming for a proper CPR application in which circulation is maintained. Similarly, not placing the hand in the correct localization during chest

compression hinders an effective CPR application (5,10). In our study, the students of faculty of medicine were found to be more successful in maintaining circulation properly.

In our study, the participants were expected to evaluate CPA case by checking the pulse and without giving a break longer than 5 seconds for chest compression at the end of every cycle. This application step was successfully performed by the participants. In a study conducted with 52 hospital workers, the majority of the participants were able to evaluate CPR performance successfully with pulse control (18). Paramedic students were found to be superior to the other groups in the evaluation the cycle in our study.

Conclusion

Scientific CPR application should be known and performed by all health professionals, especially emergency doctors and emergency pre-hospital health care professionals. Therefore, current developments in scientific guidelines should be considered and the standardized educational curricula should be established in all educational institutions where the education on health sciences is provided. In our study, the mean scores of both theoretical and practical application of paramedic students were found to be significantly higher than the students in Nursing Department and Faculty of Medicine, when all of the three groups were compared with each other with regard to their mean success scores of theoretical and practical applications.

Ethics

Ethics Committee Approval: Hasan Kalyoncu University, approval number: 2018-05; date: 06.06.2018.

Informed Consent: Written consent was obtained from all participants.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.M.O., Concept: M.M.O., S.Ç., Design: M.M.O., Ş.H.E., Data Collection or Processing: S.Ç., İ.B., Analysis or Interpretation: M.B., H.G., Literature Search: M.M.O., S.Ç., M.S., Writing: M.M.O., M.B., Ş.H.E.

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The Relationship Between State-trait Anxiety and Childhood Trauma in Patients with Acute Chest Pain

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Abstract

Aim: In the present study, we examined to investigate whether state and trait anxiety are related to childhood trauma in patients with acute chest pain (ACP). We hypothesized that childhood trauma and/or state-trait anxiety may be predictive for the distinction between non-cardiac (NCCP) and cardiac chest pain (CCP).

Materials and Methods: A diagnostic interview with 102 ACP patients was performed with DSM-IV Structured Clinical Interview-I (SCID-I). The State and Trait Anxiety Scale I-II (STAI I-II), Hamilton Depression Rating Scale (HDRS), and the short form of Childhood Trauma Scale (CTS-SF) were used to determine the level of state-trait anxiety, depression, and childhood trauma, respectively. The patients with NCCP (n=63) and CPP (n=39) were compared in terms of several sociodemographic and clinical variables. In addition to the correlation analyses, logistic regression analyses were performed to determine the associations of trait anxiety, and origin of cardiac pain.

Results: The rate of male patients tended to be higher in the CCP group compared to the NCCP group (p=0.06). The patients in the NCPP group were younger than those in the CCP group (p<0.0001). In total sampling, the STAI II scores were significantly correlated with total, physical, and emotional abuse subscale scores of CTQ-SF and with the scores of HDRS. Logistic regression analyses indicated that female gender and earlier age were associated with NCCP.

Conclusion: In our study, higher levels of trait anxiety seemed to be correlated with total, emotional, and physical subscale scores of CTQ-SF. Earlier age and female gender were found to be the predictors for non-cardiac origin of the chest pain.

Keywords: Chest pain, childhood trauma, state -trait anxiety

Introduction

One of the most frequent reasons for application to emergency departments (ED) is acute chest pain (ACP). In 40-60% of patients with ACP, a diagnosis of non-cardiac chest pain (NCCP) that excludes angina is considered by cardiologists (1,2). NCCP patients are found to report somatization, anxiety, depression, and decrease in the quality of daily life (3-10). Anxiety has a key role in pain regulation, and some of the autonomic symptoms of anxiety are also seen in NCCP, which may explain the association between higher levels of anxiety and NCCP (11). Epidemiological studies have clearly indicated that adverse childhood experiences, such as abuse or neglect, increase the risk of depression (12), posttraumatic stress disorder (13), panic disorder (14), social anxiety disorder (15), and obsessive-compulsive disorder (16). Previous studies also reported a strong relationship between childhood history of trauma and chronic fatigue syndrome (17), cardiovascular disease (18), fibromyalgia and other chronic pain syndromes (19,20).

Although many authors have studied the psychiatric status of patients with NCCP and ACP separately, there are a few studies investigating the psychiatric profiles of CCP and NCCP patients concurrently. The role of childhood trauma and anxiety for cardiac pain has not been studied enough to date yet. In the present study, we examined the relationship of state and trait anxiety with childhood trauma among a sample of patients with ACP. We hypothesized that adverse childhood experiences were

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associated with higher state and/or trait anxiety in ACP patients. We also supposed that childhood trauma history in relation to state and/or trait anxiety might differentiate the CCP and NCCP patients.

Materials and Methods

Study Subjects

G power 3.1.9.2 analysis was used to determine the sample size. We estimated that at least 104 patients should be included in the study (effect size d=0.493, 1- β err prob=0.80; α err prob=0.05).

We screened 116 patients presenting with ACP, who were admitted to ED of a university hospital between August 2017 and September 2018. The subjects with a known coronary heart disease or other life threatening non-cardiac pathology, (pneumonia, acute abdomen, urinary tract infection), acute ST elevation, hypertensive crisis and a history of psychoactive drug use, a mental disorder like schizophrenia, other psychotic disorders, bipolar affective disorder, and mental retardation were excluded from the study (n=12). The remaining participants (n=102) underwent a 4-6-hour observation period by emergency physicians, during which serial physical examination, electrocardiogram, and cardiac enzyme measurements were performed on the arrival and at the sixth hour of admission. All subjects were consulted to the cardiology department for the assessment of a cardiac origin pain. According to the guidelines and current practice in ED for chest pain (21), patients were considered to have low likelihood of being included in the ischemic chest pain group (n=63) if they had: 1) A judgement of non-angina chest pain made by screening physicians, 2) A normal standard 12-lead ECG with no consecutive change in comparison with previous ECG and, 3) normal cardiac enzyme levels on arrival and six hours later. If all criteria were met, they were recognized as non-cardiac chest pain.

Questionnaire

After all medical assessments were completed, the patients with CCP (n=39) and NCCP (n=63) were invited to an interview with a psychiatrist provided that their medical status were stable and appropriate for the interview. After obtaining informed consent, participants were given some questionnaires to complete in the emergency clinic after the interview with psychiatrist (B.D), based on the structured clinical interview for DSM IV Structured Clinical Interview-I for Axis I Disorders (SCID-I) (22,23). All the participants were administered the State-Trait Anxiety Inventory (STAI I-II) (24,25) and Hamilton Depression Rating Scale (HDRS) (26,27). STAI I-II is a commonly used scale to measure the severity of state and trait anxiety. It can be used in clinical settings to differentiate between the temporary condition of "state anxiety" and the long-standing "trait anxiety". It has 20 items for measuring trait anxiety and 20 items for state anxiety. Higher scores indicate greater anxiety. A cut-off value of 41 for the STAI-I and a value of 44 for the STAI-II were used to determine the patients with low and high state-trait anxiety. The HDRS is the most widely used clinician-administered depression assessment scale. The original version contains 17 items evaluating the symptoms of depression within the past week. A score of 0-7 is generally accepted to be within the normal range or in clinical remission.

To assess experienced maltreatment in childhood and adolescence, we used the Short Form of Childhood Trauma Questionnaire (CTQ-SF) (28,29). The scale includes the subscales of emotional abuse (EA), physical abuse (PA), sexual abuse (SA), emotional neglect (EN) and physical neglect (PN). The study received full ethical approval from the University Research Ethics Committee, in accordance with the Helsinki Declaration.

Statistical Analysis

Data were analyzed on SPSS (Statistical Package of Social Sciences) version 20. Results are presented as mean and standard deviation for the quantitative variables and percentages for the qualitative variables. In the Univariate analysis, the chi-square test was used for the qualitative variables and the Fischer exact test was used wherever applicable. For normally distributed data, the Student's t test was used in comparison of the mean values of two different groups. The relationships among several clinical variables were assessed by the Pearson's correlation analysis.

We performed logistic regression analysis to determine the variables which would predict the distinction between NCCP and CCP. The independent variables were assigned according to the results of the comparison and correlation analyses. Overall percent correct classifications were 72.0%. The possible variables that predicted the severity of trait anxiety were determined through the linear regression analyses.

Results

Table 1 demonstrates the comparison results of ACP patients with NCCP (n=63) and CCP (n=39). There were no significant differences between two groups in terms of the scores of HDRS and STAI I-II; the total and subscale scores of CTQ-SF. Although the difference did not reach to a significance level, the rate of the males tended to be higher in the CCP group compared to the NCCP group (p=0.06).

In total sample, there was a significant correlation between the STAI-I and STAI-II scores (r=0.53, p<0.0001). As indicated in Table 2, the STAI-I scores did not correlate with age, the severity of depression, and the total or subscale scores of CTQ-SF. We found

Table 1. The comparison of cardiac and non-cardiac chest pain patients

	CPP (n=39)		NCCP (n=63)		Statistical analyses		
	n	%	n	%	X^2	df	p
Gender							
Male	27	69.2	32	50.8	3.35	1	0.06
Female	12	30.8	31	49.2			
	M	SS	M	SS	t	df	p
Age	61.0	11.5	44.9	16.6	5.22	100	<0.0001*
HDRS	23.7	10.2	26.3	13.7	-0.99	100	0.32
STAI I	40.5	10.3	41.8	9.7	-0.61	100	0.53
STAI II	46.5	9.6	46.0	9.7	0.22	100	0.88
CTQ-SF total	38.2	9.37	37.9	8.9	0.17	100	0.82
Emotional abuse	6.8	2.6	7.3	2.9	-0.94	100	0.34
Physical abuse	5.4	1.23	5.7	1.8	-0.71	100	0.47
Emotional neglect	11.2	4.4	10.7	4.1	0.51	100	0.61
Physical neglect	8.6	3.2	7.9	2.8	1.00	100	0.30
Sexual abuse	5.4	1.7	5.3	1.5	0.16	100	0.86

*p<0.05

CPP: Cardiac chest pain, NCCP: Non-cardiac chest pain, HDRS: Hamilton Depression Rating Scale, STAI: State and Trait Anxiety Scale, CTQ-SF: Short Form of Childhood Trauma Questionnaire

Table 2. The correlations between STAI I-II and several variables

	STAI-I	STAI-II
Age	r=-0.11, p=0.23	r=-0.12, p=0.20
HDRS	r=0.07, p=0.46	r=0.35, p<0.0001*
CTQ-SF total	r=0.09, p=0.34	r=0.238, p=0.01*
Emotional abuse	r=0.09, p=0.37	r=0.29, p=0.003*
Physical abuse	r=0.04, p=0.64	r=0.29, p=0.01*
Emotional neglect	r=0.10, p=0.27	r=0.12, p=0.22
Physical neglect	r=-0.01, p=0.94	r=0.05, p=0.55
Sexual abuse	r=0.10, p=0.30	r=0.13, p=0.19

*p<0.05

HDRS: Hamilton Depression Rating Scale, STAI: State and Trait Anxiety Scale, CTQ-SF: Short Form of Childhood Trauma Questionnaire

Table 3. Multinomial logistic regression for determining the factors which would predict the origin of the chest pain

	Beta	OR	(95% CI)	p
Age	-0.081	0.922	0.889-0.957	<0.0001
Gender	1.136	3.113	1.124-8.621	0.02
HDRS	0.023	1.023	0.979-1.069	0.31
STAI				
I	0.020	0.952	0.963-1.081	0.49
II	0.039	0.962	0.910-1.017	0.17
CTQ-SF	0.008	1.008	0.947-1.073	0.80

*p<0.05

HDRS: Hamilton Depression Rating Scale, STAI: State and Trait Anxiety Scale, CTQ-SF: Short Form of Childhood Trauma Questionnaire, CI: Confidence interval

that STAI-II scores were significantly correlated with total (r=0.23, p=0.01), physical abuse (r=0.29, p=0.01), and emotional abuse (r=0.29, p=0.003) subscale scores of CTQ-SF, and with the scores of HDRS (r=0.35, p<0.0001).

We performed a logistic regression analysis to determine the variables which would predict the origin of the chest pain. When age, gender, and the scores of HDRS, STAI I-II, and CTQ-SF were entered into the logistic regression analyses, we found that younger age (OR: 0.92, CI: 0.88-0.95, p<0.0001) and female gender (OR: 3.43, CI:1.14-10.31, p=0.02) significantly predicted the patients with NCCP (Table 3).

Discussion

The relation between psychosocial stress factors and cardiovascular diseases has been an important research topic. There are many studies reporting that anxiety accompanies chest pain in 31-56% of patients. Anxiety -related disorders are often considered among the causes for NCCP (30,31). Some of the previous studies reported that patients with NCCP were found to be more worried, tense and frightened when compared to the reference group (8). Anxiety and emotional stress may lead to chest pain by causing increased muscle tension (32) or chronic activation of hypothalamic-pituitary-adrenal axis (33). In addition, the prevalences rates of anxiety and depression were found to be similar among individuals with a cardiac diagnosis and those diagnosed with NCCP (34,35). In accordance with these reports, our findings demonstrated that there were no significant differences in STAI I-II, HDRS, and CTQ-SF scores between ACP patients with NCCP and CCP. However, we have found a strong relationship between the severities of state and trait anxiety in total sample. In contrast to state anxiety scores, the severity of depression, and emotional and physical abuse appeared to be

strongly correlated with trait anxiety scores. Particularly, physical abuse was found to significantly predict the severity of trait anxiety. Therefore, these results may suggest that the subjects who experienced more severe childhood trauma had more anxious traits and became more susceptible to develop an anxiety in case of ACP. The patients with higher anxious traits also appeared to be more depressive during ACP. Previously, high levels of trait anxiety have been reported in adult and adolescent patients with histories of childhood physical and sexual abuse (36,37). However, our findings might not indicate that the relationship between childhood trauma and anxiety scores is specific for ACP patients. These results should be confirmed in larger samples in comparison to healthy controls or to patients with other somatic complaints.

Exposure to childhood maltreatment and psychological trauma has been associated with increased vulnerability to adult psychiatric and physical health outcomes. Abuse survivors also report experiencing more pain in relation to their health problems (38,39). It is known that the levels of anxiety and depression are high in these patients, and chronic pain is related to the somatization of anxiety and depression (39). Several theories have been proposed to explain the increased pain in trauma sufferers. Childhood abuse is associated with a negative attributional style (37) and an inability to manage stress (40) to exacerbate pain. Trauma-related alterations may amplify pain by lowering pain thresholds (41). In this study, we hypothesized that childhood trauma might be a clinical marker which would help to differentiate the CCP and NCPP. In contrary to our hypothesis, we failed to find any associations between the origin of chest pain and the childhood trauma or state-trait anxiety in patients with ACP. Female gender and the earlier ages of the patients appeared to be the strongest predictors of NCCP. In consistent with our findings, some of the previous studies reported that female patients with chest pain presented with anxiety more frequently (42). Thus, female patients with chest pain are twice more consulted to cardiologists when compared to male patients (43). While male patients display psychological symptoms of anxiety such as tension and an intuition of a bad event, female patients tend to present the physical symptoms of anxiety including chest pain, palpitation, shortness of breath, and nausea (44).

Conclusion

We suggest that childhood trauma, particularly physical abuse may be associated with trait anxiety, and therefore may predispose the patients to develop an acute anxiety during ACP. In contrast to our expectations, adverse experiences in childhood did not seem to be related to the type of chest pain. Emergency physicians should evaluate patients according to clinical and laboratory findings rather than subjective criteria such as level of anxiety. The age and gender were prominent predictors of a distinction between CCP and NCCP. These findings should be confirmed by further investigations with larger groups of patients. The major limitation of this study was the relatively smaller size of the sample. We did not assess the frequency of traumatic experiences, duration of the trauma, and the age when trauma first occurred. We could not examine the relationship of the severity of childhood trauma, and anxiety with chest pain.

Ethics

Ethics Committee Approval: Aydın Adnan Menderes University (approval number: 2016/878).

Informed Consent: It was taken.

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Stroke Patients with Sinus Rhythm and Atrial Fibrillation: Comparison of Echocardiography Findings

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Abstract

Aim: To compare the echocardiographic findings in stroke patients with sinus rhythm and atrial fibrillation (AF).

Materials and Methods: Descriptive, cross-sectional study. Place and Duration of Study: Department of Emergency Medicine, Adıyaman University Education and Research Hospital, from January 2014 to December 2016. Four hundred and sixty-seven subsequent stroke patients were admitted to the study. Data included demographic and echocardiographic findings. Patients are divided into the AF and sinus rhythm groups. Categorical variables were analyzed with the Fischer's Exact Test and parametric variables with the Independent Samples T Test.

Results: AF patients with stroke had a significantly lower ejection fraction, decreased left ventricular function, increased left ventricular diameters, systolic dysfunction, mitral valve insufficiency, and tricuspid valve insufficiency.

Conclusion: AF patients with stroke had a significantly lower ejection fraction, decreased left ventricular function, increased left ventricular diameters, systolic dysfunction, mitral valve insufficiency, and tricuspid valve insufficiency. AF should not be considered as a major cardiac risk factor for stroke. AF may be a consequence of multifactorial cardiac abnormalities that may have a causative effect for stroke.

Keywords: Stroke, atrial fibrillation, echocardiography

Introduction

Atrial fibrillation (AF) is a common type of arrhythmia. It is a major risk factor for ischemic stroke, especially in the elderly (1-4). Its prevalence is 1% in population, and it increases up to 6% in people older than 65 years of age. Patients with non-valvular AF have higher risk of stroke (1,2,4,5).

The aim of the study is to highlight the anatomical disorders accompanying AF in stroke patients. We evaluated the differences of echocardiographic findings in stroke patients with and without AF.

Materials and Methods

Stroke patients admitted to the emergency department of Adıyaman University Hospital between 2014 and 2016 were analyzed retrospectively. Stroke patients were identified with the ICD code I1.68 and AF patients were identified with the ICD code I48. All subsequent stroke patients' data were recorded to standard

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forms. Data included demographic and echocardiographic findings. Patients were divided into the AF and sinus rhythm groups. 467 patients were included in the study. Hundred and ten patients with recurrent stroke, hemorrhagic stroke, transient ischemic attacks and patients under 18 years of age and with incomplete data were excluded from the study. Patients were divided into the sinus rhythm and AF groups.

Table 1. Initial symptoms of patients in the emergency department

Symptoms	n (%)
Loss of consciousness	92 (19.70)
Headache	37 (7.92)
Hemiplegia, Hemiparesis	313 (67.02)
Convulsion	5 (1.07)
Dysarthria	117 (25.05)
Vertigo	49 (10.49)
General impairment	40 (8.56)

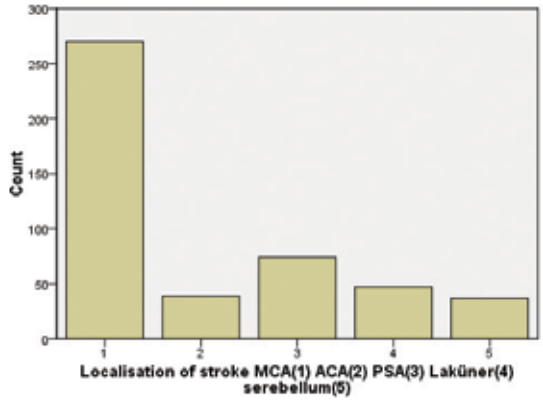

Figure 1. Localization of stroke. Middle cerebral artery (1), anterior cerebral artery (2), posterior cerebral artery (3), lacunar infarct (4), cerebellum (5)

This retrospective observational study was approved by the institutional local ethics committee of Adıyaman University Hospital (2017/5-10).

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) ver. 20. Categorical variables were analyzed with the Fischer's Exact Test and parametric variables with the Independent Samples T Test. Binary logistic regression was used to calculate odds ratio and 95% confidence interval.

Results

There were 237 (50.7%) males and 230 (49.3%) females. The mean age was 71.71±12.44 years. The mean age of patients with AF was 77.76±8.43 years and the mean age of patients with sinus rhythm was 70.53±12.75 years ($p<0.05$). Symptoms at admission are shown in Table 1.

Stroke localizations of all patients are shown in Table 2 and Figure 1. AF was noted on the initial electrocardiograms of 76 (16.2%) patients.

The mean ejection fraction of patients was 51.07±10.41 in the AF group and 55.54±9 in the sinus rhythm group. Echocardiographic findings of all patients are shown in Table 3.

Table 2. Localization of stroke

	n (%)
Middle cerebral artery	270 (53.9)
Anterior cerebral artery	39 (7.8)
Posterior cerebral artery	74 (14.8)
Lacunar infarction	47 (9.4)
Cerebellum	37 (7.4)
Total	467

Table 3. Echocardiographic findings

	Sinus rhythm	Atrial fibrillation	p value	Odds ratio	95% CI
Decreased left ventricular function	46	24	0.00006	0.642	0.274-1.504
Increased left ventricular diameters	83	28	0.005	0.882	0.452-1.720
Systolic dysfunction	30	10	0.001	0.615	0.270-1.403
Mitral valve insufficiency	77	32	0.000085	0.723	0.360-1.453
Tricuspid valve insufficiency	25	20	0.000002	0.261	0.113-0603
Diastolic dysfunction	64	9	0.390	-	-
Intracardiac thrombus	15	2	>0.05	-	-
Increased atrial diameters	46	11	0.565	-	-
Total	391	76	-	-	-

CI: Confidence interval

Discussion

AF is a common arrhythmia associated with increased risk of stroke, heart failure and death. AF occurs in 1-2% of the general population. The prevalence of AF increases in the elderly (6,7). In this study, patients with AF were statistically older. AF becomes a global health problem as the life expectancy of general population increases (8-11).

Stroke and AF have a complex interaction. In some cases, AF episodes with very short duration may be related to stroke. In some paroxysmal AF cases, stroke may occur long after the AF period. In some cases, atrial fibrillation may be triggered after a stroke. These various types of interactions between AF and stroke reveal that there is a more complex relationship than the traditional cardioembolic AF hypothesis. AF has strong associations with other cardiovascular diseases, such as heart failure, coronary artery disease (CAD), valvular heart disease, diabetes mellitus, and hypertension. Accompanying cardiac abnormalities may have potential effects on the onset of AF. In our study, AF patients with stroke had a significantly lower ejection fraction, decreased left ventricular function, increased left ventricular diameters, systolic dysfunction, mitral valve insufficiency, and tricuspid valve insufficiency. These findings are commonly associated with heart failure, coronary artery disease, and valvular heart diseases. It may be easily hypothesized that AF is only an independent risk factor for stroke. Our findings suggest that AF may be a consequence of multifactorial cardiac abnormalities that may have a causative effect for stroke (12-19).

Study Limitations

Limitations of the study are that the results of the echocardiographic findings were not assessed due to the retrospective pattern of the study and all patients were not evaluated by the same cardiologists.

Conclusion

AF patients with stroke had a significantly lower ejection fraction, decreased left ventricular function, increased left ventricular diameters, systolic dysfunction, mitral valve insufficiency, and tricuspid valve insufficiency. AF should not be considered as a major cardiac risk factor for stroke. AF may be a consequence of multifactorial cardiac abnormalities that may have a causative effect for stroke.

Ethics

Ethics Committee Approval: This retrospective observational study was approved by the institutional local ethics committee of Adıyaman University Hospital (2017/5-10).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.Ö.E., Concept: A.A., Design: İ.T., İ.A., Data Collection or Processing: A.A., Analysis or Interpretation: M.Ö.E., Literature Search: A.A., S.Ç., H.A., M.A.A., Writing: A.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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Review
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Heimlich Maneuver Complications: A Systematic Review

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Abstract

Aim: Life-threatening complications have been reported due to the widespread use of the Heimlich maneuver. As the extent of associated injuries has not been well established, a systematic review of the complications of the Heimlich maneuver was conducted.

Materials and Methods: Studies were identified through literature search in MEDLINE, Web of Science and SCOPUS up to August, 2018 with keywords related to "Heimlich maneuver" and "Abdominal thrust". The inclusion criteria were defined as case reports reporting complications due to the Heimlich maneuver and case reports with documented injuries. Original studies, reviews, conference proceedings, commentaries, and case reports with incomplete data were excluded. The CARE (CAse REport) guideline was used to assess the quality of case reports

Results: Forty-eight eligible studies involving 51 cases were included. Patient median age was 62 years and 35% of them were female. Dyspnea and abdominal pain were the most common symptoms. Gastric rupture was more likely to be associated with hospital admission, but mortality was most associated with aorta injury. Twenty-five percent of cases with organ damage survived.

Conclusion: According to case reports, the Heimlich maneuver is associated with serious complications especially in elderly patients. Life threatening injuries associated with the Heimlich maneuver suggest that this procedure should be substituted with a safer procedure such as chest thrusts or chest compressions. Investigation of an alternative procedure to remove foreign body airway obstruction is recommended in further studies.

Keywords: Heimlich maneuver, abdominal thrust, chocking, first aid

Introduction

The Heimlich maneuver was introduced in 1974 in order to prevent death from food asphyxiation (1). It is clear that any person informed on the procedure can perform the maneuver by not needing any special instrument. The elderly as a vulnerable population are predominantly affected by the Heimlich maneuver (2). Elderly patients are highly susceptible to choking due to neuromuscular disorders such as age-related changes of the nervous system, muscular dystrophy and dental problems which put them into a riskier situation during swallowing. Defective laryngeal closure, failure of bolus containment, transitional phase dissociation, and incomplete bolus transport are the main oropharyngeal abnormalities that are associated with choking episode (3). The elderly people may be even accompanied by frailty and comorbidity (2). Therefore, elderly patients received Heimlich maneuver more commonly than any other populations. Soon after, "a quick upward thrust" (abdominal thrust) became the weakest link due to excessive force directed to internal organs especially in the elderly. Although the American Medical Association endorsed the Heimlich maneuver in 1975 (4), the aggressive nature of the Heimlich maneuver raised concern about the safety measures among academic community. Despite the widespread use due to the fact that it was simple to learn and effective to save lives, academic community remained suspicious (5). They conducted research on choking animals and even humans to examine the underlying mechanism (6-8), and also published case reports of serious complications. One year later, a case of

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ruptured stomach was the first documented life threatening complication. Since then,complications of the Heimlich maneuver have been reported in a consistent manner each year up to now (9). Injuries to the stomach, intestine, pancreas, aorta, esophagus and ribs were reported in the literature (2,10). Despite the poor generalizability and weak cause-effect relationship, case reports have a unique ability to be novel and hypothetic as well as explanatory (11). The educational merit of case report is also remarkable. Growing evidence of serious complications suggests that there is a genuine need to perform a systematic review on the case reports of the Heimlich maneuver. In addition, the Heimlich maneuver is mainly supported by editorial and commentaries and also it suffers from lack of evidence, so case reports are the most reliable evidence in this situation. The study aimed to systematically review the case reports on the Heimlich maneuver complications.

Materials and Methods

MEDLINE, Web of Science, and Scopus were searched beginning from their starting date to August, 2018. The search keywords were detailed asHeimlich maneuver, Heimlich manoeuvreand abdominal thrust. Duplicated citations were removed. Abstracts were initially screened to reveal relevant case reports. The inclusion criteria were defined as (1) case reports reporting complications due to the Heimlich maneuver and (2) case reports with documented injuries. Original studies, reviews, conference proceedings, commentaries, and case reports with incomplete data were excluded. All abstracts published in English were retrieved. The citation lists of included case reports were screened to discover additional case reports which might have been missed in primary search. Search strategy was illustrated in Figure 1.

Data including first author, year of publication, sex, age, event, chief complaint, type of the Heimlich maneuver intervention, role of caregiver who performed the Heimlich maneuver, main complications, comorbidity, treatment plan, and mortality status were collected. Two independent researchers (A.M. and M.E.) reviewed studies. Disagreements were resolved by consensus. The CARE (CAse REport) guideline was used to assess the quality of case reports (12). Systematic data collection according to the CARE guideline provides evidence to evaluate case reports which have been published in medical literature.

Results

Two hundred potential studies through Medline, 205 through Web of Science and 331 through Scopus were identified. Three hundred and twenty-eight of them were excluded due to duplication. Initial screening excluded 317 abstracts because they were unrelated, original research, commentary and review studies. As a result, full-text analyses of 91 remaining studies were performed. Secondary screening excluded 47 articles. Four articles were retrieved from reference list. The final inclusion covered 48 articles (Figure 1). The characteristics of all included studies are summarized in Appendix A. All relevant case reports met minimum requirements to be included in regard to the quality assessment.

The median age of the patients was 62 years and it ranged from 3 to 93 years and 31% were older than 75 years. Thirty-five percent of patients were female. The most common chief complaints were dyspnea and abdominal pain. Patients had generally received the Heimlich maneuver from bystanders rather than health care providers. Gastric rupture was more likely to be associated with hospital admission, but mortality was most associated with aorta injury. Forty-one percent of cases suffered from comorbidities. Forty percent of cases underwent surgery to repair injuries. Twenty-five percent of cases who had organ damage survived. The details of injures are presented in Appendix A. A summary of injuries associated with the Heimlich maneuver is detailed in Table 1.

Discussion

The most common injury was gastric rupture, which is reported by academic community. The lesser curvature of the stomach is ruptured in most cases. Weak abdominal muscles, especially

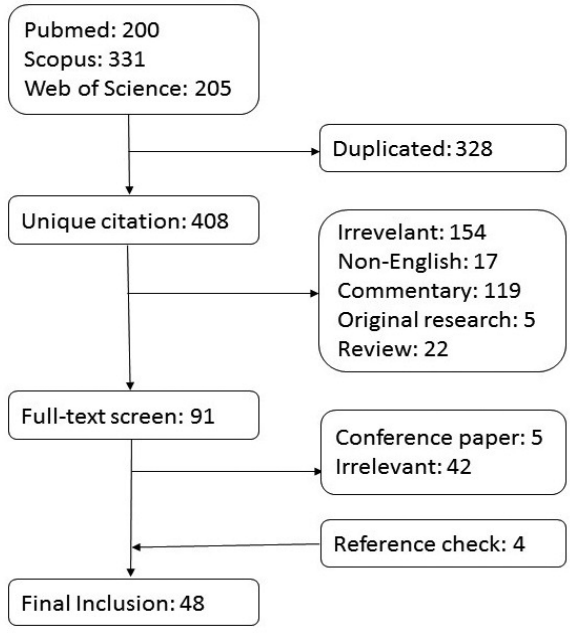

Figure 1. Flowchart of the litarature search and exclusion process

Table 1. Summary of reported injuries associated with Heimlich maneuver

Organs	Studies (Sample size)	Gender	Age	Common symptoms	Complication	Treatment	Mortality
Lung							
Edema 7,12,24,43,44,47*	5 (6)	1 F: 5 M	13 (5-50)	Dyspnea; emesis; altered mental status	Post-obstructive pulmonary edema; diffuse patchy lobular airspace disease	Supportive care	0
Pneumomediastinum 1,14,22	3 (3)	3 M	3, 19, 39	Sore throat;dyspnea; collapsed	Pneumomediastinum	Surgery; CPR	1
Emphysema 38	1 (1)	1 M	56	Dyspnea	Emphysematous bulla in apical region	Surgery	0
Ribs							
Fracture 16,18,30	3 (3)	3 F	72, 79, 90	Chest pain; pleuritic pain	Rib fractures	Supportive	0
Diaphragm							
Rupture 26,48	2 (2)	2 F	85, 85	Dyspnea	Hiatal hernia	Surgery	0
Esophagus							
6	1 (1)	1 F	45	Subcutaneous emphysema	Pharyngoesophageal perforation	Surgery	0
25,28,37,41	4 (4)	2 F: 2 M	16,56, 61,62	Odynophagia; dyspnea and chest pain	Perforation of the esophagus	Surgery	0
Stomach							
Lesser curve 4,5,9,13,17,19,23,34,50,51	9 (10)	4 F: 3 M	74 (57-93)	Abdominal pain	Gastric rupture along the lesser curvature of the stomach	Surgery	3
Volvulus 36	1 (1)	1 F	10	Abdominal pain	Mesenteroaxial gastric volvulus	Surgery	0
Pancreas							
20,29	2 (2)	2 M	3, 11	Abdominal pain	Transection; cystic mass	Surgery	0
Liver							
39,46	2 (2)	2 M	84, 88	Abdominal pain	Laceration in the hepatic lobe	Surgery	0
Small intestine							
42	1 (1)	1 M	22	Vomiting	Jejunum perforation	Surgery	0
Spleen							
8	1 (1)	1 M	83	Unconscious	Laceration of spleen	CPR	1
Aorta							
Thrombosis 2,27,32,33,35,35	5 (6)	2 F: 4 M	80 (69-84)	Paraplegia	Thrombosis and occlusion in aorta	Surgery	5
Tear 15,21,49	3 (3)	2 F: 1 M	61, 76, 78	Dyspnea; unconscious; abdominal pain	Dissection of aortic wall	Surgery	3
Valve 10,40	2 (2)	1 F: 1 M	74, 86	Dyspnea	Acute aortic regurgitation	Surgery; supportive	0
Stent displacement 31	1 (1)	1 M	63	Abdominal discomfort	Proximal type 1 endoleak	Surgery	0
Vertebra							
11	1 (1)	1 F	80	Back pain	Acute compression deformities at L1-2 levels	Kyphoplasty	0
Shoulder							
3	1 (1)	1 M	48	Shoulder pain	Rotator cuff tear	Surgery	0

*Numbers in Table 1 are associated with reference list in Appendix A

in the elderly patients cannot protect internal organs compared to those in adults. It is expected that the lesser curvature of the stomach is the most common site of involvement because it directly receives the force generated by abdominal thrust. Upward thrust above the novel generates excessive force toward the stomach. Heimlich stated that "place your fist (thumb side against the victim's abdomen) slightly above the novel and below the rib cage and grasp your fist with your other hand and press into the victim's abdomen with a quick upward thrust.", so there is a great possibility of the lesser curvature injury especially when the stomach is distended after eating a meal (1). The missing link is the fact that no instruction about how much force is required to dislodge the foreign body is given. An adult is able to produce an excessive force through an abdominal thrust which is unbearable for a senior adult or a child, resulting in fatal internal injury. A hypothesis that a choking person may benefit most from the Heimlich maneuver which is adjusted for a person at the same age may arise. There is a necessity to address this issue in further studies.

It is argued that the Heimlich maneuver may not always be the procedure of choice in all situations (13). For example, a large piece of meat can likely be dislodged by the Heimlich maneuver than more viscous materials such as peanut butter. In such situation, finger sweep technique may be more effective than the Heimlich maneuver to resolve choking especially in children. The Heimlich maneuver may not be the procedure of choice in case of esophageal impaction either. Esophageal impaction may happen in individuals who are able to vocalize during the choking. There is great possibility that untrained people may not distinguish a pseudo-choking state from an airway obstruction episode (14). In such situation, the application of abdominal thrust causes an increase in intraluminal pressures in internal organs. Impacted food in esophagus deteriorates the situation because it does not allow the pressure to be diminished and weak structure of esophagus escalates injury to a life threatening condition (4). Many scholars argued that untrained rescuers may be a part of this puzzle.

This review shows that patients may suffer from serious injuries in spite of professional help received from trained people such as nurses. Razaboni et al. (15) reported a case of jejunum perforation, who received abdominal thrust from a trained rescuer. It implies that excessive force may play a greater role than proper technique in developing injuries. The risk is much higher in choking persons with comorbidities, suggesting that individual characteristics are influential indeed. In addition, experimental studies have indicated that the intrathoracic pressure induced by upward abdominal thrust does not differ from backward abdominal thrust significantly; implying that rescuers may not require to perform the Heimlich maneuver in upward direction necessarily (16). In this way, Roehm et al. (17) argued that abdominal thrust without any upward motion may result in an increased risk of trauma to the abdominal aorta. Therefore, it can be concluded that excessive force apart from upward or backward direction is strongly associated with internal organ damage.

Alternative maneuvers: WhileAmerican Red Cross and European Resuscitation Council endorse abdominal thrusts to manage foreign body airway obstruction (FBAO) (18), the Australian and New Zealand Committee on Resuscitation (ANZCOR) does not recommend abdominal thrusts in the management of FBAO due to life-threatening complications (ANZCOR) (19). Instead, back blows and chest thrusts have been endorsed by ANZCOR. Apart from life threatening complications associated with the Heimlich maneuver, literature suggests that chest compression may produce more peak airway pressure than the Heimlich maneuver. Langhelle et al. (6) indicated that chest compression was more effective than the Heimlich maneuver in managing FBAO in unconscious patients. They showed that peak airway pressure was significantly lower with abdominal thrusts compared to chest compressions (26.4±19.8 versus 40.8±16.4 cmH_2^o) among 12 unselected cadavers. In this way, Guildner et al. (20) concluded both the chest thrusts produced significantly better results than did the abdominal thrust on six adult male anesthetized volunteers and introduced chest thrust as technique of choice. Therefore, it raises concern about widespread interest and popularity of the Heimlich maneuver. In fact, experiments show that chest thrusts are more effective than abdominal thrust in terms of generating higher peak airway pressure.

In addition, several studies have been performed on airway peak pressure in different positions to simulate choking episode. Pavitt et al. (16) indicated that self-administered thrusts over the back of a chair delivered significantly greater pressure than the Heimlich maneuver did and it might increase the chance of injury, too. A manikin study revealed that the lying down abdominal thrust was associated with higher peak pressures than the standing abdominal thrust (22.6±2.8 versus 11.5±2.6) (7). However, another study indicated that abdominal thrusts produced greater airway pressure than chest thrusts among pigs (13.8±6.7 versus 6.5±3), the major difference in the chest anatomy between human and pig weakens the generalizability of findings (21,22). Finally, Blain et al. (23) proposed the table maneuver as a safer alternative to the Heimlich maneuver. It is performed by giving sharp blows in a choking person who has been laid down on a table in the prone position with the head facing downwards and the arms hanging over the side of the table. They argued that this maneuver was associated with better results than the Heimlich maneuver.

Appendix A. Reported complications associated with Heimlich maneuver

No	Study	Sex	Age	Event	Compliant	Intervention	Caregiver	Complication	Comorbidity	Treatment plan	Mortality
1	Agia & Hurst (1979) (1)	Male	19	Airway obstruction due to food	Retrosternal discomfort and dyspnea	Heimlich maneuver	Bystander	Pneumomediastinum	-	Pharmacological treatment	No
2	Ayerdi et al. (2002) (2)	Male	70	Airway obstruction due to food	Paralysis of both legs	Heimlich maneuver	Bystander	Thrombosed 4.5 cm abdominal aortic aneurysm and right common iliac artery aneurysm	Right femoral bypass graft	Exploratory laparatomy	No
3	Baker & Mullet (2015) (3)	Male	48	Performed Heimlich maneuver on a fellow restaurant dinner	Left shoulder pain having begun 3 month ago	Heimlich maneuver	Bystander	Rotator cuff tear	-	Subacromial decompression and arthroscopic rotator cuff repair	No
4	Bintz & Cogbill (1996) (4)	-	-	Airway obstruction due to food	Abdominal pain	Heimlich maneuver	Bystander	Full-thickness gastric rupture along the lesser curvature of the stomach	-	Surgery	Yes
5	Bintz & Cogbill (1996) (4)	-	-	Airway obstruction due to food	Abdominal pain	Heimlich maneuver	Bystander	Full-thickness gastric rupture along the lesser curvature of the stomach	-	Surgery	No
6	Bouayed et al. (2015) (5)	Female	45	Airway obstruction due to food	Subcutaneous emphysema	Heimlich maneuver	Nurse	Pharyngoesophageal perforations and right piriform sinus fracture	Mentally disabled	Exploratory cervicotomy	No
7	Casoni et al. (2010) (6)	Male	13	Airway obstruction due to candy	Blood stained sputum	Heimlich maneuver	Bystander	Post-obstructive pulmonary edema	-	Supportive	No
8	Ceccheto et al. (2011) (7)	Male	83	Airway obstruction due to food	Unconscious	Heimlich maneuver as well as CPR	Nurse	Acute laceration of spleen	-	CPR protocol	Yes
9	Chao et al. (2012) (8)	Female	59	Airway obstruction due to food	Post CPR admission	Heimlich maneuver as well as CPR	EMT	Gastric perforation	-	Exploratory laparotomy	No
10	Chapman et al. (1983) (9)	Male	86	Airway obstruction due to food	Sever shortness of breath progressingover five days	Heimlich maneuver	Bystander	Acute aortic regurgitation	Mild aortic insufficiency	Pharmacologic treatment	No
11	Chillag et al. (2010) (10)	Female	80	Airway obstruction due to food	Incapacitating pain in back	Heimlich maneuver in two days earlier	Bystander	Acute compression deformities at L1-2 levels	Osteoporotic thoracic vertebral fractures	Kyphoplasty	No
12	Chien et al. (2007) (11)	Male	49	Airway obstruction due to food	Dyspnea	Heimlich maneuver	Bystander	Post-obstructive pulmonary edema	-	Supportive	No
13	Cowan et al. (1987) (12)	Male	74	Airway obstruction due to food	Abdominal discomfort	Heimlich maneuver as well as CPR	Bystander	Gastric perforation	Parkinson`s disease	Exploratory laparotomy	No

Appendix A. Contiuned

14	Croom (1983) (13)	Male	39	Airway obstruction due to food	Collapsed	Heimlich maneuver as well as CPR	Bystander	Pneumomediastinum	Cerebral palsy	CPR protocol	Yes
15	Desai et al. (2008) (14)	Female	78	Airway obstruction due to food	Unconscious	Heimlich maneuver	Nurse aid	Laceration and dissection of an atherosclerotic abdominal aortic wall	Schizophrenia	Exploratory laparotomy	Yes
16	Drinka (2009) (15)	Female	90	pseudochoking	Pleuritic pain	Heimlich maneuver	Nurse aid	Rib fracture	Hear failure	Monitoring	No
17	Dupre et al. (1993) (16)	Male	93	Airway obstruction due to food	Abdominal pain	Heimlich maneuver	Bystander	Gastric rupture	-	Exploratory laparotomy	No
18	Entel & Hakki (1996) (17)	Female	79	Airway obstruction	Chest pain	Heimlich maneuver	Bystander	Multiple rib fracture	-	Supportive treatment	No
19	Fearing & Harrison (2002) (18)	Female	74	Airway obstruction	Abdominal pain	Heimlich maneuver on supine	Bystander	Gastric rupture along the lesser curvature of the stomach	-	Surgery	No
20	Feeney et al. (2007) (19)	Male	11	Seizure	Abdominal pain	Heimlich maneuver	Bystander	Transection of the pancreas	-	Distal pancreatectomy	No
21	Feldman et al. (1986) (20)	Male	61	Airway obstruction due to food	Sharp chest pain and dyspnea progressed over five days	Heimlich maneuver	Bystander	Transverse tear of the aortic root	-	Surgery	Yes
22	Fink & Klein (1989) (21)	Male	3	Airway obstruction due to plastic toy	Sore throat	Heimlich maneuver	Bystander	Pneumomediastinum	-	Pharmacological treatment	No
23	Gallardo et al. (2003) (22)	-	-	Airway obstruction	-	Heimlich maneuver	-	Perforation of the lesser gastric curvature	-	Laparoscopic surgery	No
24	Galster et al. (2014) (23)	Female	50	Airway obstruction	Altered mental status	Heimlich maneuver	Bystander	Post-obstructive pulmonary edema	-	Pharmacological treatment	No
25	Haynes et al. (1984) (24)	Female	61	Airway obstruction due to food	Dyspnea and chest pain	Heimlich maneuver	Bystander	Perforation of the esophagus resulting in hydropneumothorax	-	Surgery	No
26	Herman et al. (2018) (25)	Female	85	Airway obstruction due to food	Dyspnea and pleuritic chest pain	Heimlich maneuver in supine position	Medical staff	Diaphragmatic rupture and hiatal hernia	-	Laparotomy	No
27	Kirshner & Green (1985) (26)	Male	69	Airway obstruction due to food	Unable to move leg	Heimlich maneuver	Bystander	Acute aortic occlusion due to thrombosis	Abdominal aortic aneurysm	Surgery	Yes
28	Koss et al. (2018) (27)	Male	16	Airway obstruction due to food	Throat pain and odynophagia in 5 days later	Heimlich maneuver	Bystander	Esophageal perforation	-	Surgery	No

Appendix A. Contiuned

29	Lee et al. (2002) (28)	Male	3	Airway obstruction due to food	Abdominal pain	Heimlich maneuver	Bystander	Cystic mass with a pancreatic pseudocyst	-	Percutaneous drainage of the pseudocyst	No
30	Lette et al. (1990) (29)	Female	72	Airway obstruction	Sharp chest pain	Heimlich maneuver	Bystander	Multiple rib fracture	-	Supportive treatment	No
31	Lin et al. (2003) (30)	Male	63	Airway obstruction due to food	mild abdominal discomfort	Heimlich maneuver	Bystander	proximal type I endoleak	Endovascular abdominal aortic aneurysm (AAA) repair with modular stent-graft devices	Surgery	No
32	Mack et al. (2002) (31)	Female	80	Airway obstruction due to food	Mottled from the umbilicus caudad with absent distal pulses	Heimlich maneuver on a prone	Bystander	Complete infrarenal aortic occlusion	debilitated	Surgery	Yes
33	Mack et al. (2002) (31)	Male	84	Airway obstruction due to food	Mottled from the groin distally	Heimlich maneuver on a prone	Bystander	Athrosclerotic infrarenal aorta with mural thrombus	debilitated	Surgery	Yes
34	Majumdar & Sedman (1998) (32)	Female	57	Airway obstruction due to food	Apneic arrest	Heimlich maneuver	Bystander	Injury in lesser curve of stomach	Metallic aortic valve	laparotomy	Yes
35	Martin et al. (2007) (33)	Male	81	Airway obstruction due to food	Low back pain	Heimlich maneuver	Bystander	Complete occlusion of the infra-renal abdominal aorta	Chronic obstructive pulmonary disease	Pharmacologic treatment	Yes
36	Matharoo et al. (2013) (34)	Female	10	Airway obstruction	Chest pain and abdominal pain	Self-administered Heimlich maneuver	Bystander	Mesenteroaxial gastric volvulus	-	Surgery	No
37	Meredith & liebowitz (1986) (35)	Male	62	Airway obstruction due to food	Chest pain and mild dyspnea	Heimlich maneuver	Bystander	Laceration on the right posterior esophagus	-	Surgery	No
38	Olenchock et al. (2004) (36)	Male	56	Airway obstruction	Dysphagia and shortness of breath	Heimlich maneuver	Bystander	Emphysematous bulla in the right apical region	Emphysema	Surgery	No
39	Otero Palleiro (2007) (37)	Male	88	Airway obstruction	Abdominal pain	Heimlich maneuver	Bystander	Laceration in the left hepatic lobe	-	Pharmacologic treatment	No
40	Passik et al. (1987) (38)	Female	74	Airway obstruction	Dyspnea	Heimlich maneuver	Bystander	Aortic valve insufficiency	Aortic valve replacement	Surgery	No
41	Pederson (2010) (39)	Female	56	Airway obstruction due to tablet	mild dyspnea	Heimlich maneuver	Bystander	Perforation of esophagus	-	Surgery	No
42	Razaboni et al. (1986) (40)	Male	22	Airway obstruction due to food	Vomiting	Heimlich maneuver	Bystander	Pneumoperitoneum due to jejunum perforation	Mentally retarded	Surgery	No

Appendix A. Contiuned

43	Ringold et al. (2004) (41)	Male	5	Airway obstruction due to food	Dyspnea	Heimlich maneuver as well as CPR	Bystander	Pulmonary edema	Reactive airway disease	CPR protocol	No
44	Ringold et al. (2004) (41)	Male	13	Airway obstruction due to food	Emesis	Heimlich maneuver	Bystander	Diffuse patchy lobular airspace disease	-	Pharmacologic treatment	No
45	Roehm et al. (1983) (42)	Male	62	Airway obstruction due to food	Pain in the lower extremities	Heimlich maneuver	Bystander	Completely occluded distal aorta	Pseudoaneurysm	Laparotomy	Yes
46	Tashtoush et al. (2015) (43)	Male	84	Airway obstruction due to food	unresponsiveness	Heimlich maneuver	Bystander	Hepatic rupture	-	Supportive care	No
47	Toukan et al. (2016) (44)	Male	12	Airway obstruction due to food	unconsciousness	Heimlich maneuver	Bystander	Post-obstructive pulmonary edema	-	Supportive	No
48	Truong et al. (2017) (45)	Female	85	Airway obstruction due to food	Dyspnea	Heimlich maneuver	Nurse	Increased hiatal hernia	Knee arthroplasty	Laparotomy	No
49	Valero (1986) (46)	Male	76	Airway obstruction due to tablet	Abdominal and leg pain	Heimlich maneuver on supine	Bystander	Tear in the root of mesentery	-	CPR	Yes
50	Van der Ham & lange (1990) (47)	Female	76	Airway obstruction due to food	Cyanosis	Heimlich maneuver on prone	Nurse	Rupture along the lesser curvature of the stomach	Depression	Laparotomy	Yes
51	Visintine & Baick (1975) (48)	Male	74	Airway obstruction due to food	Comatose	Heimlich maneuver	Bystander	Rupture along the lesser curvature of the stomach	-	Surgery	No

While case reports studies suffer from poor generalizability, systematic review of case series reveals cumulative effect of widespread application of the Heimlich maneuver. It is important because the Heimlich maneuver is mostly supported by editorial and there are a few studies on the efficacy of FBAO removal technique. Medical follow-up as well as alarming signs and symptoms must be considered as a key part of the Heimlich maneuver instruction. In this case, a correct estimation of complications of the Heimlich maneuver can be achieved. The Heimlich maneuver was introduced in 1974. Some journals were not published electronically in the 1970 decade, so there is a probability that some case reports would not be accessible to the electronic search.

Conclusion

Heimlich maneuver is associated with serious complications especially in elderly patients. Organ damage, especially abdominal aorta injury is the most common fatal injury. Life threatening injuries associated with Heimlich maneuver suggest that this procedure must be substituted with a safer procedure such as chest thrusts or chest compressions. Investigation of an alternative procedure to remove FBAO is recommended in further studies.

Ethics

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Authorship Contributions

Surgical and Medical Practices: N/A.

Concept: A.M., Design: A.M., M.E., Data Collection or Processing: A.M., M.E., Analysis or Interpretation: A.M., M.E., Literature Search: A.M., M.E., Writing: A.M., M.E.

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Case Report
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Gastric Volvulus: A Rare Diagnosis of Abdominal Pain

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Abstract

Gastric volvulus (GV) is a rare but life-threatening condition in case of delay in diagnosis and treatment. Herein, we presented a case of GV due to Morgagni hernia presenting to the emergency department with complaints of abdominal pain and distention. A 59-year-old male patient was admitted to the emergency department with abdominal pain and distension, nausea and vomiting. His past medical history included coronary artery disease, hypertension, multiple sclerosis and left diaphragmatic hernia. On initial examination, pulse rate was 119/min and other vital signs were normal. Abdominal examination revealed epigastric tenderness. Posteroanterior chest X-ray showed an air bubble in the left hemithorax. Thoracoabdominal CT was performed for differential diagnosis. Department of Emergency Radiology reported a mesenteroaxial gastric volvulus at the superior gastro-esophageal junction with a Morgagni hernia including left hemidiaphragmatic defect with herniation of the gastric corpus, first part of the duodenum and transverse colon. Following placement of the nasogastric tube, 1300 mL gastric secretion was drained and abdominal distention was relieved. Patient was referred to the operating room. Morgagni hernia and the diaphragm defect were repaired. During follow-up in general surgery ward, a sudden cardiac arrest developed on the 5th day and he died. If a patient presents to the emergency departmen with abdominal pain and distention, GV should be considered in the differential diagnosis, although rare.

Keywords: Abdominal pain, abdominal distention, gastric volvulus, emergency department

Introduction

Gastric volvulus (GV) is a rare but life-threatening condition in case of delayed diagnosis and treatment. It is defined as abnormal rotation of the stomach more than 180 degrees. Risk factors for GV in adults include: age greater than 50 years, diaphragmatic abnormalities (diaphragmatic injury and eventration, left lung resection or pleural adhesions), phrenic nerve paralysis, other anatomical gastrointestinal pyloric stenosis, gastroduodenal tumors or splenic abnormalities and kyphoscoliosis (1,2). Herein, we present a case of GV due to Morgagni hernia presenting to the emergency department with complaints of abdominal pain and distention.

Case Report

A 59-year-old male patient was admitted to the emergency department with symptoms of abdominal pain and distension, and nausea and vomiting. His past medical history included coronary artery disease, hypertension, multiple sclerosis and left diaphragmatic hernia. On initial examination, pulse rate was 119/min, and other vital signs were normal. Abdominal examination revealed epigastric tenderness. His white blood count was 17800/mm^3 and potassium was 3mEq/lt. Other blood count parameters and biochemistry parameters were within normal ranges. Posteroanterior chest X-ray showed an air bubble in the left hemithorax (Figure 1). Thoracoabdominal CT was performed for differential diagnosis. Department of emergency

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radiology reported a mesenteroaxial GV located at the superior gastro-esophageal junction with a Morgagni hernia including left hemidiaphragmatic defect with herniation of the gastric corpus, first part of the duodenum and transverse colon (Figure 2). The patient was consulted with general surgery clinic. Following placement of the nasogastric tube, 1300 mL gastric secretion was drained and abdominal distention was relieved. The patient was referred to the operating room. Morgagni hernia and the diaphragmatic defect were repaired. During follow-up in his observation in the general surgery ward, a sudden cardiac arrest developed on the 5th day and he died. The surgeons anticipated that cardiac arrest occurred due to pulmonary thromboembolism.

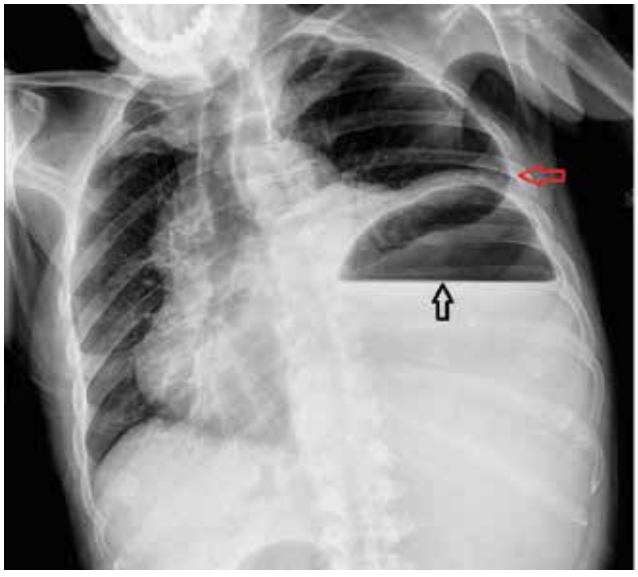

Figure 1. An air bubble in the left hemithorax on posteroanterior chest X-ray

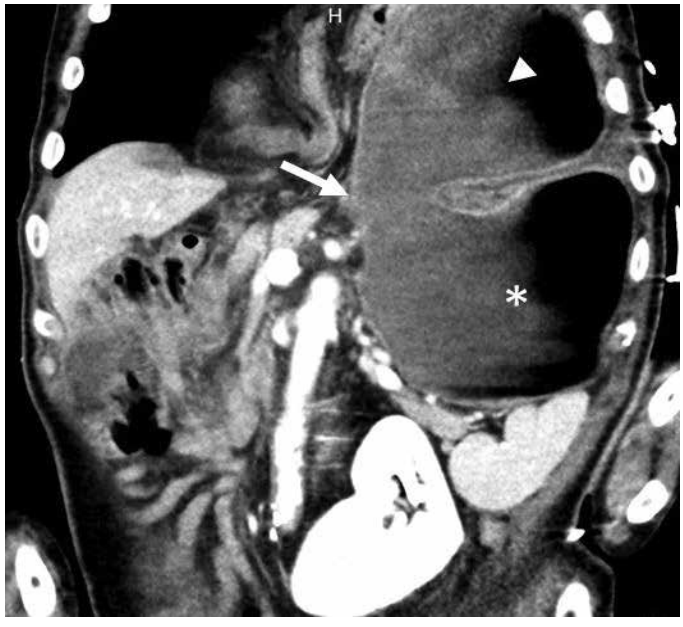

Figure 2. Coronal computed tomography multiplanar reformatted image demonstrates the displacement of the antrum above gastro-esophageal junction level (white arrow) with antrum and pylorus (arrow head located superior to the fundus and proximal body (*)

Discussion

GV is classified by its cause and axis of rotation. According to its cause, it is divided into primary or secondary GV. Primary GV is the result of neoplasm, adhesions, or abnormalities in the attachment of the stomach. Secondary GV, however, is related to disorders of gastric anatomy or function or abnormalities (1).

According to the axis of rotation, organoaxial volvulus is most common with an incidence of 60% (2). It is most commonly associated with paraesophageal hernias and diaphragmatic eventration. GV is seldom diagnosed when a patient initially presents with upper abdominal pain or lower chest pain. After a conventional abdominal or chest radiography, GV is suspected because of the specific double air-fluid level appearance.

Chest X-ray may demonstrate a retrocardiac, air-filled mass and plain abdominal X-ray may show a distended, fluid-filled stomach (1). Recently, abdominal CT is performed in patients who presented to the emergency department with abdominal pain due to the greater utility and easier accessibility of CT. A swirl sign, which is the appearance of rotation of the esophagus and stomach around each other on axial CT images, may be distinguished. (1). Upper gastrointestinal series with barium contrast is another useful diagnostic tool (3). Akhtar et al. (4) published a case report diagnosed with GV by using this imaging technique, although there was no sign of GV in abdominal CT.

Nasogastric tube decompression not only helps with symptoms of upper abdominal pain, but may also cause spontaneous derotation of the stomach. After resolving gastric distention, tension in the stomach wall decreases and perfusion improves. Early intensive care management, including hemodynamic monitoring and fluid resuscitation, is important because some patients present with shock or suspected intrathoracic gastric perforation due to gastric wall ischemia.

In the last decade, endoscopic detorsion has been performed in some patients with multiple comorbidities, which may worsen surgical success (5). Surgery is usually decided considering the clinical status of the patient, dimension of the defect and failure of the non-surgical interventions.

Our patient was diagnosed early and underwent surgery immediately. His clinical status improved during the post-operative follow-up period; however, on the 5th day, unexpected sudden cardiac arrest developed.

Conclusion

In conclusion, if a patient presents to the emergency department with abdominal pain and distention, GV should be considered in the differential diagnosis, although rare.

Ethics

Informed Consent: The patient consent form was taken from the patient's daughter.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: G.B., S.G., S.G., A.B.D., O.C., Concept: N.M.A., M.A., Design: N.M.A., G.B., Data Collection or Processing: G.B., S.G., İ.İ., Analysis or Interpretation: N.M.A., M.A., G.B., Literature Search: G.B., S.G., Writing: N.M.A., G.B.

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An Unusual Diagnosis in a Patient with Chest Pain and Decreased Left Upper Extremity Blood Pressure

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A 69-year-old male patient was admitted to the emergency department of a rural hospital with left arm and chest pain. Physical examination revealed arterial blood pressure difference between the two arms and he was referred to our hospital for further evaluation and treatment. He had a history of peripheral artery disease and he stated that he was on regular clopidogrel and cilostazol treatment. His general condition was good. He was conscious, oriented and cooperative. His vital signs were stable except for blood pressure of 90/60 mmHg in the left arm and 130/70 mmHg in the right arm. Physical examination revealed poor peripheral pulses in the left arm, but no signs of circulatory disturbances. There were no pathological findings in other system examinations. Electrocardiogram was evaluated as normal sinus rhythm. Laboratory values including cardiac enzymes were within normal limits. Computed tomography aortography (CTA) was performed due to suspected aortic dissection. Although aortic dissection was not detected in CTA, localized thrombus was seen in the proximal part of the left subclavian artery (SCA) (Figure 1, 2, 3). Low molecular weight heparin was administered subcutaneously at a dose of 0.8 mg. The patient was consulted to cardiovascular surgery clinic. The findings were evaluated in favor of chronic thrombus. The patient was advised to continue his current clopidogrel therapy and was discharged from the emergency department with the recommendation to cardiovascular surgery outpatient clinic visit.

SCA thrombosis often occurs due to progressive atherosclerosis, vascular damage (including vasculitis) or hypercoagulopathy. It can be seen in two clinical forms: acute and chronic. Chronic SCA thrombosis has been reported to be more common due to turbulent flow caused by angulation at the left SCA outlet (1). In acute form, pain in the arm, coldness, paleness and weakness of peripheral pulses may occur. Some patients in chronic form may describe claudication in the upper extremity after movement,

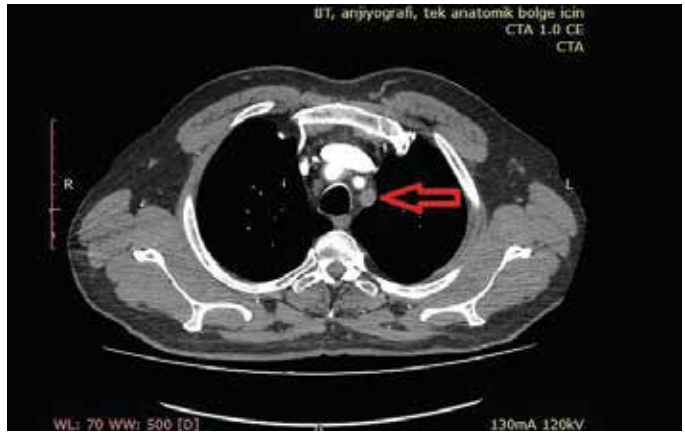

Figure 1. Occlusion of the left subclavian artery

Figure 2. Blood refilling in the distal part of the occlusion

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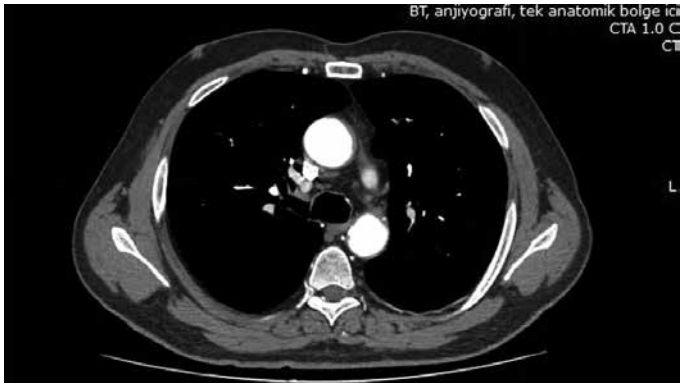

Figure 3. No findings of aortic dissection

but are usually asymptomatic. The distinction between acute and chronic SCA thrombosis is made according to clinical and radiological findings, but there are no definite criteria (2). Emergency thrombolysis or thrombectomy should be performed to prevent limb ischemia in acute form (3). In chronic form, treatment options include surgical interventions.

Emergency physicians initially attempt to rule out aortic dissection in patients with chest pain and pulse difference between extremities. However, SCA thrombosis is an important pathology that should be kept in mind, especially in patients with predisposing factors such as atherosclerosis and vasculitis, and both SCA should be carefully examined after exclusion of aortic pathologies in CTA.

Keywords: Aortic dissection, emergency medicine, subclavian artery occlusion

Ethics

Informed Consent: Was taken from patient but also any personal information was not mentioned in the text.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: K.Ş., Concept: K.K., Design: K.K., K.Ş., Data Collection or Processing: K.K., K.Ş., Analysis or Interpretation: K.K., K.Ş., Literature Search: K.K., K.Ş., Writing: K.K., K.Ş.

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Poorly Developed Scenarios May Interface with Reliability of Triage Scales

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Dear Editor,

A higher level of agreement is expected for the patients in level 5 in the triage room that nurses would have fewer difficulties to prioritize them. The chief complaint of these patients is often easy to understand and uncomplicated. In this group, people have mild symptoms or injuries such as common cold or muscle strain. They are considered as non-urgent patients because they are not critically ill. These patients should bevisited within hours of their arrival by a physician. They form a significant proportion of the patients attending the emergency department. However, they do not have serious health problems and they may unnecessarily utilize available resources designated for urgent patients. They also may cause frustration in the workplace. Nurses believe that these patients interfere in the care of patients with serious illnesses (1).

Triage scales primarily aim to recognize emergency patients, so it is probable that they neglect to provide a precise definition for non-urgent ones. It is reported that level 5 of triage scales may not be defined as practically distinct from other levels (2). In this line, Ekins and Morphet (3) reported that consistency of triage decisions with the Australasian Triage Scale (ATS) level 5 is 0.47, which is the lowest among other categories. They concluded that the overall level of inter-rater agreement is 0.4 or 'fair-to-good'. However, they attributed fair consistency to the poor judgment of emergency nurses, which may be due to the fact that the level 5 criteria are poorly developed within the ATS. Also, a recent study by Allen et al. (4) raised concerns about possible ambiguity in level 5 criteria in the ATS. They reported that interrater reliability is found to be kappa =0.27. In this study, pediatric nurses used the ATS criteria for triage 8 scenarios. Three of them are designated for level 5. Nearly half of the patients were assigned to level 4 instead of level 5 in these three scenarios. This sort of disagreement may be due to the criteria overlap between level 4 and level 5 rather than low concordance among nurses.

The first scenario is defined as a 4 -year-old patient with 24 h-sore throat, which isafebrile with no other symptoms. The second one is defined as a 3-year- old patient with earache overnight, now resolved. Temperature is 37.6°, respiratory rate is 16, oxygen saturation is 98%. The third one is defined as a 18-month- old patient with struck in back of head by toy, having a 2 cm laceration with well approximated but not bleeding edges. There is no loss of consciousness. Patient is alert and active. It must be said that pain and level of consciousness are the most important criteria to influence nurses` decisions in these scenarios. Nurses are allowed to assign alert children with mild pain to either level 4 or 5 using pediatric physiological discriminators. In fact, differences between level 4 and 5 criteria are limited to dehydration signs and symptoms and neurovascular compromise, so all three scenarios could be assigned to level 4 or 5 correctly. If scenarios were designated as representing distinct categories, reliability would be higher than what is reported by Allen et al. (4) While Craig et al. (5) have indicated that significant administrative concerns play a role in poor reliability among nurses in this study, we believe that the poorly developed scenarios for level 5 should be regarded as the key player. Researchers widely use scenarios to assess the reliability of triage decisions among nurses or physicians. It must be noted that scenarios must be strictly adjusted to the triage scales criteria in order to present

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concordance among nurses purely. Therefore, it is recommended level 5 criteria in ATS be revised.

Keywords: Reliability, triage, emergency, triage scales

Ethics

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