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DERLEME REVİEW

CARDIOPULMONARY RESUSCITATION AND REBOA

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ABSTRACT

The use of Reboa in emergency services has been proven to be effective in gastrointestinal bleeding, trauma and many clinical conditions that may result in hemorrhagic shock. However, Reboa, which we can see at a case-by-case level in cardiopulmonary resuscitation, has been the subject of many articles in recent years, but only in some studies has a decrease been detected in end-tidal Co2 pressure. Effectively evaluating the prognosis of traumatic and non-traumatic cardiac arrest cases with Reboa will be possible with more wide-spread use of Reboa in emergency services.

***Keywords**: Reboa, Cardiopulmonary resuscitation*

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Reboa(Resuscitative endovascular balloon occlusion of the aorta) is the temporary occlusion of the aorta using an endovascular balloon, reducing bleeding and ensuring myocardial and cerebral perfusion. It was first applied to 2 patients diagnosed with myocardial infarction, and an increase in the patients' systolic, diastolic and coronary perfusion pressures was observed (2). Myocardial infarction, which was cured with reboa despite the development of asystole later, was reported (3). Transfer time and ischemia time should be evaluated carefully, and partial embolization should be applied if necessary. Organ damage may occur with embolization exceeding 30-60 minutes. The effect of reboa on brain damage is controversial (4).

Reboa Indications

Life-threatening bleeding, transient response to resuscitation.

Abdominal aortic aneurysm rupture (5)

Obstetric emergency bleeding (6,7)

Gastrointestinal bleeding (8)

Tumors (9)

Bleeding due to trauma (10)

Distal thoracic aorta in life-threatening bleeding under the diaphragm; In severe pelvic bleeding and proximal lower extremity bleeding, the distal abdominal aorta is inflated.

Zone 1: from the left subclavian artery to the celiac trunk (preferred zone for cardiac arrest)

Zone 2: between the celiac trunk and the distal renal artery

Zone 3: extends from the distal renal artery to the aortic bifurcation (11,12).

Duration?

The optimum duration should be determined and should be compatible with resuscitative thoracotomy. (30-60 minutes) (13).

Procedures

Aorta procedure: arterial Access, Balloon catheter placement, balloon blowing, Deflating the balloon after the procedure

Endovascular variable aortic control (EVAC): flow control with a syringe device connected to the reboa catheter. It reduces bleeding and prevents ischemia in preclinical models.

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Partial REBOA (pREBOA): blood flow is slowed down with a titratable balloon. Contra-lateral pulse loss, arterial wave, and fluoroscopy can be used to monitor the balloon inflation rate. The lower extremity amputation rate dropped to 0.3% due to timing. However, we can say that the severity of injury is more important than the operation technique (10).

Complications

Distal embolization and lower extremity ischemia are the most common complications related to the procedure.

Vascular and port site complications are approximately 1%-10%.

Bleeding-related complications 1%-25%.

Aortic rüptüre

Amputation

Pseudoaneurysm.

Compartment syndrome.

Systemic complications: Acute renal failure, respiratory distress, infection, sepsis, multiple organ failure.

In a review study, the rate of all complications was between 11% and 54% (10).

Emergency Medicine

Trauma-related hemorrhagic shocks are an important cause of mortality in trauma patients. In the aorta, peritoneum, retroperitoneum or distal junctional regions are used for the procedure. The American College of Emergency Physicians, the National Association of Emergency Medical Services Physicians, a 2019 joint statement from American College of Surgeons Committee on Trauma, and the National Association of Emergency Medical Technicians stated, by a specialist or surgeon who will provide bleeding control REBOA can be applied. It can also be performed in consultation with a specialist who will provide bleeding control (13). However, in cases where surgeons cannot be reached, the patient is treated by emergency medicine doctors. Studies have shown that bleeding time is halved with REBOA applied by emergency room staff (14) and that emergency room doctors can be trained on REBOA (15). Studies have shown that REBOA training is permanent for approximately 4 months, but they also emphasize the importance of seeing frequent cases (16). In a study on the use of REBOA in the treatment of hemorrhagic shock in trauma patients, it was observed that REBOA reduced mortality from approximately 90% to 50%. In this study conducted in Japan, it was also reported that the emergency department hybrid system and REBOA training were effective (17).

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In a study on the application of reboa to gastrointestinal bleeding, surgeons or emergency room doctors managed the process. In this study, a significant increase was observed in the systolic blood pressures of patients who underwent reboa, but all patients included in the study died (8).

It was discussed whether the use of CT could be effective in achieving hemostasis in trauma patients who underwent Reboa. Studies showed that there was no change in mortality in patients who underwent CT (18,19). In these studies, arterial pressure was measured from the femoral artery and a 5-French arterial cannula was placed in the femoral artery. When no response was obtained, a change was made to a 7-French cannula. The control of whether there was a response to blood product resuscitation was by measuring systolic blood pressure.

An increase in systolic blood pressure above 80 mmHg was an indication of a response. FAST and Chest X-Ray were used in all patients, and if FAST was positive, Zone 1; If FAST is negative, ZONE 3 is determined. Transfer of patients to the operating room or transfer for interventional radiology purposes was effective in the decision for CT. However, the common feature of the mentioned studies was the exclusion of patients in need of cardiopulmonary resuscitation (18,19).

Cardiopulmonary resuscitation and Reboa In 1985, it began to be shown in animal experiments that reboa provides cerebral and mitocardial perfusion in non-traumatic cardiac arrest (20). Animal experiments were conducted in which Reboa was found to be effective in long-lasting CPRs (21). Cases of reboa use with cardiac arrest began. A patient who developed ventricular fibrillation and subsequent cardiac arrest developed a pulseness only in his left lower extremity with reboa applied 60 minutes after the start of CPR, and was discharged without neurological sequelae on the 36th day of his hospitalization. We estimate that being a young patient is effective in keeping the complication rate at a minimal level (22). Resuscitative thoracotomy continues to be used in patients who develop cardiac arrest due to trauma (23). It has been shown that better results are obtained with Reboa compared to resuscitative thoracotomy (16). In recent years, different results have been obtained with the application of reboa in non-traumatic cardiac arrest patients. In a study including 15 patients, it was observed that cerebral oxygenation increased minimally at the 2nd minute with reboa, but there was no change in arterial pressure and end-tidal Co2 levels (24). In a study of 20 cases where traumatic and non-traumatic cardiac arrests were evaluated together, there was a significant increase in end-tidal CO2 levels (25). In a study in which coronary perfusion pressure was also evaluated, there was a significant increase in coronary perfusion pressure, arterial pressure and end-tidal CO2 pressure after reboa (26).

On the other hand, it was also reported that balloon rupture occurred after reboa during CPR in a cardiac arrest patient (27). Undoubtedly, CPR quality, duration, and reboa technique were effective in this feedback. Considering that although ECMO is effective, it requires serious resources, it seems that reboa will be easier and more effective in emergency departments, and reboa was even recommended in the field outside the emergency department (28). In a field study

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including 10 patients who developed out of hospital cardiac arrest, there were no complications due to reboa and an increase in end tidal CO2 pressure was observed (29).

Limitations: catheter application, catheter location, correct position of the balloon, emergency room conditions.

In the studies we mentioned, there are deficiencies regarding how long it takes for the balloon to be deflated or reboa times. However, we understand that adrenaline increases myocardial oxygen consumption and its effect on alpha receptors is similar to reboa, and we see that the term 'mechanical adrenaline' has also taken its place in the literature.

It should not be forgotten that the rate of neurological damage will be high in CPR that exceeds 20 minutes on average (12). Survival rates in out-of-hospital cardiac arrest cases are less than 10%. If we consider recovery without neurological deficit, it can be said that this rate is even lower (30). However, each country has different communication methods and different cardiopulmonary resuscitation practices for out-of-hospital cardiac arrest situations (such as manual or mechanical cardiac depression).

As a result for non-traumatic cardiac arrest cases, we can say that Reboa increases coronary and cerebral perfusion and compensates for the effect of adrenaline reducing cerebral perfusion. After catheter placement, blood sampling and fluid and blood transfusion procedures will be easier. Whether it is prehospital or hospital arrest cases; Working with a professional team will reduce complications related to reboa (31).

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ARAŞTIRMA MAKALESİ RESEARCH ARTICLE

INVESTIGATION OF THE CONTRIBUTION OF DIAGNOSTIC IMAGING TO DIAGNOSIS AND TREATMENT IN THE EMERGENCY SERVICE IN MODERATE AND SEVERE ISCHEMIC STROKES

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ABSTRACT

Introduction: Brain CTor MRI is recommended as the first choice of imaging method for patients in ED.However, there is no clear scientific data about the effect of additional imaging techniques besides solely CT or MRG on management and outcome of patients when they were used as additively.We were aimed to determine the effect of this additive imaging methods on the clinical management and outcome of stroke patients with a moderate- severe NIHSS score (>5) in ED. Method: In this study, 5148 patients admitted to Dokuz Eylül University Hospital Emergency Department between 1st of January, 2013 and 31st of December, 2015 were investigated retrospectively. All patients with ICD codes of ischemic stroke (I63 and I68) and a National Institute of Health Stroke Scale (NIHSS) score> 5 via Hospital Information Management System were included in the study. Computerized statistical analysis programs were used toanalyze the variables. Results: A total of 440 patients, 235 (53,4%) were female and the mean age of the patients was 72,9±12 years. In addition to brain CT imaging solely, neitherbrain CT angiography nor MRI affectedthe devicion for treatment modification (including intravenous tormbolitics), and clinical outcomes(p=1, p=0,285, respectively).However, it was found that every additive imaging modality had caused the extension of the length of stay in ED(p<0,001). Conclusion: We found that, any additive imaging modality besides solely CT or MRG for stroke patient with moderate and severe NIHSS scores, did not alter decision for iv trombolitic treatment and clinical outcomes in ED.

Keywords: *stroke, imaging modality, emergency department, computerized tomography ,magnetic resonance imaging*

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INTRODUCTION

Stroke is the third leading cause of death worldwide, after heart disease and cancer. In 2012, 46.2 percent (17.5 million) of deaths due to non-infectious diseases (NCDs) worldwide were due to cardiovascular diseases. 7.4 million of these deaths are due to ischemic heart disease and 6.7 million are due to stroke (1).

In recent years, in parallel with the developments in imaging methods, it has been shown that significant improvement can be achieved with early recognition of acute ischemic stroke and thrombolytic treatment within 4-6 hours after the appearance of symptoms.(2) Ischemia is included in the differential diagnosis of all neurological symptoms of cerebral origin. Therefore, it is important to detect or exclude it at an early stage.

Brain CT is the first choice imaging method in patients with suspected ischemic stroke all over the world due to its easy accessibility.(3). In the AHA guideline, non-invasive vascular imaging is recommended within 48 hours (3). However, it is not known how much performing one of these tests or both of them changes the diagnosis and treatment process. Based on this, in our study, we planned to primarily describe the imaging methods used in patients with suspected moderate-severe ischemic stroke in our hospital, and to investigate the rate of diffusion MRI and/or Brain CTA examinations performed in addition to Brain CT and their effects on the diagnosis and treatment processes.

Material-Method

Patient selection and study design

This study was conducted in the emergency department of Dokuz Eylül University Hospital between 01.01.2013 and 12.31.2015.By examining the hospital information management system, 5,148 patients over the age of 18 who applied to the emergency department and were coded with ICD diagnosis codes I63 to I68 with suspicion of stroke were evaluated retrospectively. 440 patients with a National Institute of Health (NIHSS) score >5 were included in the study.

Patients with a previous history of ischemic or hemorrhagic stroke, bleeding strokes such as epidural hematoma, subdural hematoma, subarachnoid hemorrhage, cerebral venous thrombosis, and transient ischemic attack were not included in the study. . Ethical approval was received for the study from Dokuz Eylül University Non-Interventional Research Ethics Committee. Patients' age, gender, admission, hospitalization and discharge dates, anamnesis and neurological examinations, and NIHSS stroke scores calculated at the time of admission were recorded from the hospital information management system file.Imagings performed on the patients included in the study and the time of these imagings were examined. The treatments applied to the patients (ASA, LMWH, unfractionated heparin, thrombolytic therapy), clinical outcomes (Admission/Discharge/death/referral), and length of stay in the emergency department were recorded. The duration of the neurology consultation was calculated as the time between the emergency physician typing the consultation on the hospital information and management system and pressing the send button, and the neurologist expressing her/his opinion about the patient via the hospital information management system. Patients with missing or controversial information in the file were excluded from the study.

Statistical analysis

SPSS 22.0 (IBM Corporation, Armonk, New York, United States) program was used to analyze the variables. The suitability of the data for distribution was evaluated with the Shapiro-Wilk test and the homogeneity of variance was evaluated with Levene. In comparing two independent groups with each other based on quantitative data, the Independent Samples T test was used with Bootstrap results, while the Mann-Whitney U test was used with Monte Carlo results. In comparing independent multiple groups with each other based on quantitative data, Kruskal-Wallis H Test, one of the nonparametric tests, was used with Monte Carlo simulation technique results, and Dunn's Test was used for Post Hoc analyses. Spearman's rho test was used to examine the correlations of the variables with each other. In comparing categorical variables with each other, the Pearson Chi-Square test was tested with the Monte Carlo Simulation technique. Quantitative variables are shown in the tables as mean ± std. (standard deviation) and median Range (Maximum Minimum), and categorical variables are shown as n (%). Variables were examined at a 95% confidence level and were considered significant if the p value was less than 0.05.

Results

Among the 440 patients included in the study, it was determined that the majority of female patients were present and the average age of female patients was higher (p<0.001) (Table 1)

Table 1.Table showing the gender and age characteristics of the patients

Gender	AGE				P Value
	n (%)	Average±SD.	Maximum	Minimum	
woman	235 (53,4)	76,26±11,65	100.0	39.0	**<0,001**
man	205 (46,6)	69,01±11,73	95.0	34.0	
Total	440 (100)	72,88±12,22	100.0	34.0	

Independent T Test(Bootstrap) / SD.: standard deviation

The average NIHSS score of the patients during their admission to the emergency department was 11.0±4.5. The lowest NIHSS score was found to be 6 and the highest NIHSS score was 33.The tests and treatments applied during the patients' admission to the emergency department and their follow-up in the emergency department are shown in table 2.

Table 2. Table showing the examinations and treatments applied to patients during their admission to the emergency department and their follow-up in the emergency department

		Average±SD.	Median (Minimum / Maximum)
NIHH Score		11,0±4,55	10 (6 / 33)
		n	%
Applicaiton time	during working hours	140	
	out of working hours	300	
Brain CT in Emergency Department	Not done	4	
	Done	436	
Brain CT Angiography in Emergency Department	Not Done	150	

	Done	290
Dffusion MR in Emergency Department	Not done	271
	Done	169
The Treatment after CT in Emergency Department		
	Antiaggregant	112
	Anticoagulant	12
	Thrombolytic	173
The treatment after CT anghiography in Emergency Department	no change	110
	Antiaggregant+ Antiacoagulant	28
	Antiaggregant	18
	Anticoagulant	8
	Thrombolytic	14
The Treatment after diffusion MR in Emergency Department	no change	235
	Antiaggregant+ Antiacoagulant	15
	Antiaggregant	19
	Anticoagulant	12
	Thrombolytic	4
Outcome in the emergency department	no change	102
	Antiaggregant+ Antiacoagulant	32
	Discharged	1
	Exitus	9

Patient outcome	Transfer to another hospital	21
	inpatient follow-up	391
	intensive care follow-up	18
	Discharged	359

In our examination to find out the average number of minutes after the patient's admission to the emergency department, the average brain CT time was 22 (±35.7) minutes, the average brain CT angiography time was 187.5 (±214.8) minutes, and the average diffusion MRI time was 278.5 (±208.4) minutes (Table 3).

Table 3. Table showing the NIHH scores of patients diagnosed with ischemic stroke at the time of their admission to the emergency department and the time elapsed during their follow-up.

	N	Average±SD.	Median (Minimum / Maximum)
Duration of Brain CT scan in the Emergency Department (min.)	435	22,1±35,72	15 (1 / 496)
Brain CT Angiography Duration in the Emergency Department (min.)	290	187,5±214,89	130 (7 / 2505)
Diffusion MRI Duration in the Emergency Department (min.)	169	278,5±208,48	227 (14 / 1128)
Requesting a Neurology Consultation (min.)	440	45,5±70,02	31 (1 / 746)
Thrombolytic therapy Duration (min.)	163	83,1±39,89	77 (25 / 321)
Thrombectomy/Catheterization administration (min.)	21	175,4±76,70	153 (63 / 328)
Length of stay in Emergency Department (Hours)	440	12,0±15,70	6 (1 / 150)

The relationship between the use of diagnostic methods and treatment selection is shown in table 4.

Table 4. The relationship between the use of diagnostic methods and treatment selection

		n	%
thrombolytic therapy			
	Treatment After Brain CT in Emergency Department	169	90.9%
	Treatment After Brain CT angiography in Emergency Department	14	7.5%
	Treatment after Diffusion MR in Emergency Department	4	2.2%
Antiaggregant Treatment			
	Treatment After Brain CT in Emergency Department	104	73.8%
	Treatment After Brain CT angiography in Emergency Department	18	12.8%
	Treatment after Diffusion MR in Emergency Department	19	13.5%
Anticoagulant Treatment			
	Treatment After Brain CT in Emergency Department	11	35.5%
	Treatment After Brain CT angiography in Emergency Department	8	25.8%
	Treatment after Diffusion MR in Emergency Department	12	38.7%
Antiaggregant + Anticagulant			
	Treatment After Brain CT in Emergency Department	28	37.3%
	Treatment After Brain CT angiography in Emergency Department	15	20.0%
	Treatment after Diffusion MR in Emergency Department	32	42.7%

The intervals between the imaging method used before the procedure and the procedure performed in patients who underwent thrombolytic therapy or thrombectomy/catheterization are shown in Table 5. While the average time between diffusion MRI and clot dissolver application was 47 minutes, this time was found to be 76.5 minutes for CT and 109 minutes for CT angiography. (Table 5). When the average time between imaging method selection and thrombectomy/catheterization procedure was evaluated, it was found to be 150 minutes for brain CT, 167 minutes for brain CT angiography, and 183 minutes for patients who underwent diffusion MRI (Table 5). No statistically significant difference was detected between the imaging methods and the time until the procedure was performed for both procedures (p=0.063 and 0.503, respectively).

Table 5. Comparative table showing the distribution of thrombolytic therapy and endovascular interventions according to imaging methods.

	Thromolytic Treatment (min.)			**Thrombectomy/Catheterization (min)**		
	Median	**Maximum**	**Minimum**	**Median**	**Maximum**	**Minimum**
Brain CT	76.5	321.0	25.0	150.0	328.0	63.0
Brain CTAngiography	109.0	155.0	41.0	167.0	271.0	84.0
Diffusion MR	47.0	47.0	47.0	183.0	328.0	131.0
P Value	**0.063**			**0.503**		

Kruskal Wallis Test(Monte Carlo) / Max.:Maximum - Min.: Minimum

The decision to change treatment after the patients are diagnosed with ischemic stroke and the evaluation of this situation in terms of its effect on the clinical outcome are shown in table 6. When all clinical outcomes of the patients in the emergency department were evaluated, no statistically significant relationship was found between Brain CT, Brain CT angiography, Diffusion MR and treatment change (p = 0.059, p: 1, p: 0.285, respectively)

Table 6. Distribution of patients with stroke diagnosis in the emergency department according to clinical outcomes and imaging methods

Treatment Change	Oоutcome in Emergency Department				P Value
	Ex	Tranfer another hospital	Inpatient follow up	İntensive Care follow up	
	n (%)	n (%)	n (%)	n (%)	
Brain CT					
Done	7 (77,8)	11 (52,4)	291 (75,2)	15 (88,2)	0.059
Not done	2 (22,2)	10 (47,6)	96 (24,8)	2 (11,8)	
Brain CTAngiography					
Done	1 (33,3)	1 (12,5)	50 (18,9)	3 (21,4)	1
Not Done	2 (66,7)	7 (87,5)	214 (81,1)	11 (78,6)	
Diffusion MR					
Done	0 (0,0)	4 (44,4)	63 (40,9)	0 (0,0)	0.285
Not Done	3 (100,0)	5 (55,6)	91 (59,1)	3 (100,0)	

Pearson Chi-Square Test (Monte Carlo)

A weak and negatively significant correlation was found between the mean NIHSS score calculated at the time of admission to the emergency department and the imaging examination performed in the emergency department. No significant relationship was found between the time until brain CT scan and the number of examinations performed in the emergency department. A weak positive correlation was found between the mean time until neurology consultation and the number of imaging methods, but this correlation could not be demonstrated for the NIHSS score (p=0.373).(Table 7) No significant association was found between the mean time to thrombolytic therapy and thrombectomy/catheterization and the imaging study in the emergency department or NIHSS score. No significant relationship was found between the mean time for thrombolytic therapy and thrombectomy/catheterization and the number of imaging studies performed in the emergency department or the NIHSS score. A weak positive relationship was found between the length of stay in the

emergency department and the number of imaging methods selected, but this relationship was not found for the NIHSS score (Table 7).

Table 7. Table evaluating the relationship between clinical practices in the emergency department and the number of examinations and NIHSS scores of patients.

	Number of Imagining		**NIHH Score**	
	r	**P**	**r**	**P**
NIHH Score	**-0.214**	**<0,001**		
Brain CT Scanning Time in the Emergency Department (min.)	0.093	0.052	**-0.099**	**0.039**
Brain CTAngiography Scanning Time in the Emergency Department (min.)	**0.301**	**<0,001**	-0.083	0.158
Diffusion MR Scanning Time in the Emergency Department (min.)	0.138	0.073	-0.010	0.892
Neurology Consultation Request Time (min.)	**0.152**	**0.001**	-0.043	0.373
Thrombolytic Therapy Time (min.)	0.048	0.544	0.052	0.511
Thrombectomy/Catheterization time (min.)	0.315	0.164	0.023	0.923
Length of stay in Emergency Department (Hours)	**0.178**	**<0,001**	0.028	0.557

Spearman's rho Test

The patients were divided into four groups: patients who underwent brain CT only (group I), patients who underwent brain CT and diffusion MRI (group II), patients who underwent brain CT and CT angiography (group III), and patients who underwent all three examinations (group IV). There were statistically significant differences between the groups in terms of mean NIHSS score, mean length of stay in the emergency department, and mean time for neurology consultation (table 8).

Table 8. Comparative table showing the effects of imaging methods and their combinations taken in the emergency department on NIHH score, duration of neurology consultation and length of stay in the emergency department in patients with stroke diagnosis

Combination of İmagining test	**NIHSS Score**	**Neurology Consultation duration (min.)**	**Length of stay in Emergency (hour)**

		Median (Max.-Min.)	Median (Max.-Min.)	Median (Max.-Min.)
Brain CT	**=I**	13 (33 - 6)	30 (746 - 2)	4,5 (80 - 1,17)
Brain CT + MR	**=II**	9 (26 - 6)	38 (229 - 4)	11 (150 - 2)
Brain CT+ BRAİN CTAngi-ography	**=III**	11 (26 - 6)	25 (676 - 1)	4,02 (101 - 1)
BrainCT+Brain CTAngiography+ MRG	**=IV**	8 (28 - 6)	39,5 (305 - 3)	8,63 (49 - 1,75)
P Value		**<0,001**	**<0,001**	**<0,001**
Paired Compari-sons	**I→II**	**0.002**	**0.009**	**0.003**
	I→III	0.650	0.485	1
	I→IV	**<0,001**	**0.035**	**0.004**
	II→III	**0.046**	**<0,001**	**<0,001**
	II→IV	1	1	1
	III→IV	**0.001**	**<0,001**	**<0,001**

Kruskal Wallis Test(Monte Carlo) - Post Hoc Test : Dunn's Test / Max.:Maximum - Min.: Minimum

The mean NIHSS score of group I patients was 13 and the mean NIHSS score of group II patients was 9, and a statistically significant difference was found between the groups (p=0.002). A statistically significant difference was found between Group I and Group IV in terms of NIHSS score. (p<0,001)There was also a statistically significant difference between the groups in terms of neurology consultation and length of stay in emergency department (p=0.035 and p=0.004, respectively). When comparing Group II and Group III, a statistically significant difference was found, especially in the duration of stay in the emergency department and the request for neurology consultation. These durations were found to be significantly shorter in Group III (p<0.001).

The relationship between the time until catheterization and the imaging methods applied to the patients is shown in Table 9. No statistically significant difference was found between the imaging method selection and the average time until catheterization (p=0.501).

Table 9. Table showing the distribution of stroke patients who underwent catheterization-endovascular intervention according to the imaging method and its effect on the duration of catheterization application.

	Catheterization			
	Brain CT	**Brain CTAngiography**	**Diffusion MR**	**P Value**
	(n=11)	**(n=7)**	**(n=3)**	
	Median (Max.-Min.)	**Median (Max.-Min.)**	**Median (Max.-Min.)**	
Thrombectomy/Catheterization time (min.)	150 (328-63)	167 (271-84)	183 (328-131)	0.501

Kruskal Wallis Test(Monte Carlo) / Max.:Maximum - Min.: Minimum

When the admission times of the patients were grouped as working hours and out of hours and the NIHSS scores, the average time for imaging methods, the duration of neurology consultation, the thrombolytic treatment, the time for thrombectomy/catheterization and the average length of stay in the emergency department were evaluated, no significant statistical difference was found between the relevant variables in the patients' applications during and out of hours (p=0.095-1) (Table 10).

Table 10. Table showing the examination and follow-up of patients in the emergency department, their clinical findings at the time of admission, and the distribution of their admissions according to working hours.

	Application		
	During Working hour	**Out of working hour**	**P Value**
	Median (Max. Min.)	**Median (Max. Min.)**	
NIHH Score	10 (28 - 6)	10 (33 - 6)	0.897
Duration of Brain CT scan in the Emergency Department (min.)	13 (496 - 2)	15 (350 - 1)	0.673
Brain CT Angiography Duration in the Emergency Department (min.)	136 (699 - 7)	129 (2505 - 12)	0.609
Diffusion MRI Duration in the Emergency Department (min.)	198 (636 - 14)	240 (1128 - 29)	0.095

Requesting a Neurology Consultation (min.)	33 (746 - 2)	30 (726 - 1)	0.423
Thrombolytic therapy Duration (min.)	83,5 (183 - 35)	77 (321 - 25)	0.240
Thrombectomy/Catheterization administration (min.)	151,5 (328 - 103)	167 (328 - 63)	1
Length of stay in Emergency Department (Hours)	6 (117 - 2)	6 (150 - 1)	0.711

Mann Whitney U Test (Monte Carlo) / Max.:Maximum - Min.: Minimum

DISCUSSION

In our study, in which we aimed to examine the effects of brain CT, brain CTAngiography and diffusion MR imaging performed in patients with moderate and severe ischemic stroke diagnosed according to NIHSS score in the emergency department on treatment changes in the emergency department, clinical outcome and length of stay in the emergency department; we found that Brain CT imaging was effective in initiating thrombolytic therapy. Diffusion MR and brain CTAngiography examinations performed in addition to CT after ischemic stroke diagnosis in the emergency department could not be shown to have an effect on diagnosis and treatment changes in the emergency department, emergency department outcomes, and outcomes in clinics, and it was also found that these examinations prolonged the length of stay of patients in the emergency department.

Jan et al (4) and Elmer et al (5) found the average waiting time in the emergency department to be 5 hours in two studies that included patients diagnosed with ischemic stroke, and in both studies, no relationship was found between length of stay in the emergency department and the clinical outcomes of the patients. In our study, the average waiting time of patients in the emergency department was found to be 12 hours, which was found to be considerably longer than the studies by Jan et al (4) and Elmer et al (5). We believe that this situation may significantly affect clinical outcomes. The reasons for this long period are the slow circulation and insufficient number of beds in the neurology ward, stroke unit, and neurology intensive care unit in our hospital.

There are many studies showing that prolonged stay of critically ill patients in the emergency department increases mortality (6,7). In a multicenter study conducted by Chalfin et al. in the USA with data on 50,000 critically ill patients, it was found that patients whose stay in the emergency

department was longer than 6 hours had a 1.5-fold increase in hospital mortality (8). Rincon et al (9) reported in their study of 519 stroke patients published in 2010 that staying in the emergency department for 5 hours or more was an independent risk factor for poor outcome of the disease. However, Al-Khathaami et al. (10) did not find a significant relationship between poor outcome and length of stay in the emergency department in their study of 300 stroke patients. In a study conducted by Minaeian et al. (11) on 325 stroke patients, a significant relationship was found between short duration of stay in the emergency department and poor 90-day outcome. The most important factors in the contradiction between studies are the stroke units, technological developments and triage systems that institutions have. However, in our study, it was observed that patients waited in the emergency department for a long time for hospitalization and further treatment. We believe that there is increased morbidity and mortality in patients waiting in the emergency department. We believe that new strategies and the opening of adequate and appropriate stroke services may lead to significant results in terms of clinical outcomes.

In our study, thrombolytic therapy was applied to 163 (42.5%) patients and the average time from emergency room application to treatment was determined as 83.1 (±39.8) minutes. Our rate of thrombolytic therapy application was found to be quite low compared to literature information (12,13,14,15), and the time elapsed before patients applied to the emergency department and the inadequate awareness of patients about stroke can be considered as the main reasons for this low rate.

Many guidelines recommend that patients diagnosed with ischemic stroke in the emergency department have their brain CT scans and interpretations performed rapidly within the first 45 minutes. In our study, the average time between patients' application to the emergency department and CT scans was 22.1 (±35.7) minutes, which was close to the desired level.

In our study, it was observed that the numerical increase in the application of additional imaging methods in the emergency department to our patients with moderate and severe NIHSS scores had no effect on the clinical outcome. For this reason, it is of great importance that patients are admitted to neurology and stroke care units after diagnosis and that subsequent imaging methods are re-evaluated in the services where the patients are admitted.

After the diagnosis of stroke patients in our study, the effect of additional imaging methods was evaluated, and the least treatment change decision was monitored in the patient group with Brain CTAngiography, while the group with the most treatment change was evaluated as the group with brain CT. The reason for this was considered to be that brain CT quickly excludes bleeding and enables thrombolytic therapy in patients examined with moderate and severe ischemic stroke in our hospital.

However, we found that the use of other imaging methods in the follow-up of patients who received antiplatelet, anticoagulant and thrombolytic therapy after the diagnosis of ischemic stroke in our emergency department did not have a significant effect on the changes in the treatment and outcomes of the patients. In this respect, we believe that we have opened a new area of discussion on a subject that is rarely emphasized in the literature.

We state that the use of NIHSS score and ASPECTS scoring in Brain CT imaging is still valid in the evaluation of patients and that Brain CT is still a very useful imaging method in choosing treatment in cases where MR cannot be obtained.

CONCLUSION

According to the results of our study, in patients with clinically suspected stroke and moderate and severe NIHSS scores, the use of additional imaging methods such as Brain CTAngiography, diffusion MR or more than one imaging method after diagnostic Brain CT or Brain MR imaging has minimal changes in the primary and secondary clinical outcomes during the treatment process.

Additional imaging modalities prolong patients' stay in the emergency department. It would be more appropriate to develop more cost-effective imaging protocols in the management of patients and to perform additional imaging methods in appropriate neurology clinics (ward, stroke center or intensive care) in order to avoid disruption of the treatment and follow-up process in patients diagnosed with ischemic stroke.

Limitation

Since only patients diagnosed with stroke were evaluated in this study, the sensitivity and specificity of the requested examinations could not be determined. In addition, due to the retrospective nature of the study, there was a significant decrease in the number of patients included in the study, due to insufficient data and patient files filled out outside of the study design. In addition, the lack of detailed data on when treatments were started for patients diagnosed with ischemic stroke in the emergency department, which treatment was given first, and for how long, constitutes an important shortcoming of our study.

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ARAŞTIRMA MAKALESİ RESEARCH ARTICLE

EVALUATION OF INJURIES REFERRED TO EMERGENCY SERVICE DURING EID-AL-ADHA

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ABSTRACT

Eid al-Adha is an important religious holiday held every year in Muslim countries as a form of social assistance and celebration. Especially during the Eid al-Adha period, many differences can be observed in the injury areas in emergency departments in terms of sharp object injuries. Studies conducted to date have shown that injuries are particularly due to trauma in the hand region. This prospective and observational study included patients who presented to the emergency department of Ankara Yıldırım Beyazıt Training and Research Hospital with DKAY due to Eid al-Adha between 11/6/2011 and 11/9/2011. 17.9% (n=27) of the participants were female and 82.1% (n=124) were male. When the distribution of the time the patients presented to the emergency department was evaluated; 58.9% (n=89) at the 1st hour, 19.9% (n=30) at the 1st-6th hour. There were 2.6% (n=4) applications between 7-12 hours, 15.2% (n=23) applications between 13-24 hours, 3.3% (n=5) applications after 24 hours. When the treatments of the patients were evaluated; 18.5% (n=28) had tendon repair, 22.5% (n=34) minor surgical repair, 7.9% non-invasive dressing, 13.9% (n=21) outpatient analgesia prescription, 1.3% (n=2) minor surgical repair and splint, 15.9% (n=24) tendon repair and splint, 7.3% (n= 11) splint application. Especially during the Eid al-Adha, injuries related to cutting cause a serious loss of workforce throughout the country. However, the costs allocated to hospital density and health services are increasing. Especially in patients with tendon injuries, sequelae and the rehabilitation period after treatment in many cases are becoming a serious public health problem. It is thought that evaluating this situation from a public health perspective and taking the necessary precautions and warnings before Eid al-Adha can reduce such injuries.

Keywords: *trauma in the hand region, Eid al-Adha, emergency department*

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INTRODUCTION

Eid al-Adha is an important religious holiday held every year in Muslim countries as a social solidarity and celebration. Eid-al-Adha lasts 4 days, and generally the community sacrifices more animals on the first day than on the other days (1,2). Apart from the fact that animal slaughtering is carried out in experienced hands on non-holiday days, people, in the excitement of the holiday, cause many injuries while sacrificing their own animals. In addition to injuries, this situation increases the crowding and workload of emergency services, which take an active role in public hospitals on holidays. In Muslim countries, all institutions except the health sector take leave during religious and national holidays. For this reason, it is called long-term holiday or leave, especially when the leave period is increased during holiday periods. During this period, emergency room density increases. In Muslim countries, Eid al-Adha is celebrated every year during the month of Hajj, and a large number of cattle or small animals are slaughtered during this month. Many injuries are caused during slaughtering and chopping of meat (2).

Especially during the Eid al-Adha period, many differences can be observed in the injury areas in emergency departments in terms of stab wounds. Studies conducted so far have shown that injuries are due to trauma in the hand area (3,4).

Our aim in this study is to examine the traumas that develop especially during the Eid al-Adha and, in the light of the data obtained, to make the necessary arrangements in emergency services in terms of early diagnosis and treatment planning of these sharp object injuries during busy holiday days and to develop preventive medical regulations against preventable accidents.

MATERIALS AND METHODS

In this prospective and observational study, patients who came to Ankara Yıldırım Beyazıt Training and Research Hospital emergency department between 6.11.2011 and 09.11.2011 due to Eid al-Adha, were included in the study. Patients who did not want to participate in the study or had missing data were excluded from the study. Ethics committee approval was received for the study. A form containing the sociodemographic characteristics of the patients and a trauma disease evaluation form were used as data collection tools. Demographic data (age, gender), application time,

location of the incident, professional experience, trauma location, and consultation procedures of the patients included in the study were recorded.

Statistical analysis:

A statistical software package (SPSS 20.0, Chicago,IL) was used to perform all analyses. As statistical analyses, normal distribution test for all variables and compliance of Kolmogorov Smirnov test with parametric test criteria were evaluated. Pearson chi-square and Fisher's sharp chi-square tests were used to evaluate the categorical (nominal or ordinal) quality of related variables. Statistical significance was determined as $p<0.05$.

RESULTS

A total of 151 patients were included in the study. The average age of the patients was 43.06+1.14. Their distribution according to age groups is summarized in Table 1. There was a statistically significant difference according to age groups ($p<0.05$).

17.9% (n=27) of the participants were female and 82.1% (n=124) were male. When the distribution of patients' admission to the emergency department and arrival time is evaluated; 58.9% (n=89) at Hour 1, 19.9% (n=30) at Hour 1-6. In hourly terms, there were 2.6% (n=4) complaints between 7-12 hours, 15.2% (n=23) between 13-24 hours, and 3.3% (n=5) after 24 hours. This difference was also statistically significant (<0.05). When the consultation clinics of the patients were evaluated, 27.8% (n=42) underwent plastic and reconstructive surgery and 54.3% (n=82) underwent orthopedic consultation. The injury areas of the patients are summarized in Table 1. Accordingly; 68.2% (n=104) of all traumas consisted of penetrating trauma, and 94.3% (n=98) of these traumas were hand trauma. 16 of the blunt traumas were chest and abdominal trauma, and 5 of these patients were hospitalized for 24-hour follow-up due to intra-abdominal free fluid (Table 2). When the treatments given to the patients are evaluated; 18.5%(n=28) had tendon repair, 22.5%(n=34) minor surgical repair, 7.9% non-invasive dressing, 13.9%(n=21) outpatient analgesia prescription, 1.3%(n=2) minor surgical repair and splint. , 15.9% (n = 24) were tendon repair and splint, 7.3% (n = 11) were splint application. There was a significant difference between the groups in the treatments applied (<0.05). The professional experiences of the patients are given in Table 1. The difference between groups was statistically significant (<0.05).

Table 1. Demographic data of patients

Demographic Characteristics - Independent Variables (IVs)	Name of Characteristics	Label	Number	Percent (%)	Mean	Sdt. Dev.	p value
Gender	Female (0)	FEML	27	17.9			
	Male (1)	MALE	124	82.1			
	TOTAL		***151***	***100***			
Age	***TOTAL***	***AGE***	***151***		***43.6***	***1.14***	
Age Group	Between 0-10 years		***1***	***1***			
	Between 11-20 years		***7***	***4***			
	Between 21-30 years		***20***	***13.2***			
	Between31-40 years		***35***	***17.5***			
	Between 41-50 years		***39***	***23.1***			
	Between 51-60 years		***30***	***19.8***			
	Over >60 years		***19***	***12.5***			
							<0.05
Injury status	**Penetrating(1)**		104	68.2			
	Blunt (2)		47	31.8			
Application time	**1st hour (1)**		89	58.9			
	1-6 hours (2)		30	19.9			
	7-12 hours (3)		4	2.6			
	13-24 hours(4)		23				
	>24 hours (5)			15.2			

			5	
				<0.05
Consultation Clinics	**Orthopedics**	82	54.3	
	Plastic surgery	42	27.8	
Professional Experience	**Butcher**	5	3.3	
	Not a Butcher	146	96.7	<0.05
Treatmen	**Non-Interventional Recommen-dations**	12	7.9	
	Analgesia only	21	13.9	
	Minor surgical repair	34	22.5	
	Minor surgical repair and splint	2	1.3	
	Tendon Repair	28	18.5	
	Tendon Repair and Splint	24	15.9	
	Splint	11	7.3	
	Operation	2	1.3	
				<0.05

Table 2. Injury type and areas of patients

Injury Site	Blunt	Penetrating
Hand	8(%16.3)	98(%94.3)
Lower Extremity	17(%36.7)	4(%3.8)
Head-neck	6(%12.2)	2(%1.9)
Body	16(%34.7)	
Total	47	104

DISCUSSION

Today, approximately 10-30% of injuries admitted to the emergency department are finger and hand injuries. In our country, this rate is approximately 26% (3). During Eid-al-Adha, a lot of hand traumas come to the emergency department due to various stabbing and stabbing injuries during animal slaughter and meat dismemberment, and this increases the workload of the emergency department.

When the injuries related to animal slaughter during the Eid al-Adha, which is the subject of our study, are evaluated, even though the average age is similar to previous studies, the density is seen in the 21-30 age group and the patient groups over 50 years of age, which are noteworthy in our study (1,5). In our study, there was 82.1% male population in terms of gender, which is similar to other studies (6). It is thought that this difference exists because men are more often involved in sacrificing patients (7). In another study conducted after our study, it was observed that the rates changed, but the gender differences did not change (8).

Caliskan et al. In their research, they report that they arrive in the first hour of injuries (5). Likewise, in our study, this occurred especially in the first hours of admission to the emergency department. In our study, especially in extremity injuries, it is seen that lower extremity injuries are more often in the form of blunt injuries rather than stab wounds. In a study, especially hand trauma was observed to be more frequent, but lower extremity rates were higher in terms of NSLN compared to our study. However, Çalışkan et al. In their study, unlike our study, tendon injuries were found to be lower than ours, although the number of patients was higher. In parallel with this, plastic surgery and orthopedic consultations were observed to be low (5). When evaluated in terms of professional experience, it is seen that the injury rates of butchers are very low compared to other professional groups. We think that these rates will decrease more frequently due to the frequent markets or certain organizations nowadays.

The limitation of our study is that it was a study conducted in a short period of time and that these patient groups were distributed to many hospitals, especially during the Eid al-Adha, as it was a metropolitan city.

Conclusion

Injuries due to slaughter, especially during Eid al-Adha, cause serious workforce loss throughout the country. However, hospital density and costs allocated to health services are increasing. Especially in patients with tendon injuries, the sequelae and the need for a rehabilitation period after treatment in many cases become a serious public health problem. Considering this situation as a public health issue, taking the necessary precautions and warnings before Eid-al-Adha suggests that such injuries can be reduced.

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VAKA TAKDİMİ CASE REPORT

A RARE CAUSE OF DYSPHAGIA: UPPER AIRWAY HEMATOMA DUE TO WARFARIN OVERDOSE

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ABSTRACT

Oral anticoagulants, including warfarin, are pharmacological agents frequently used for various indications today can cause life-threatening bleeding. Upper airway hematoma associated with anticoagulant use is a rare condition that requires urgent diagnosis and management. In this case report, we aim to present a rare case of upper airway hematoma secondary to warfarin use. The choice of treatment options for upper airway hematomas should be based on the patient's symptoms and the degree of airway obstruction. When symptoms of airway obstruction appear, the airway must be rapidly secured before complete blockage occurs. When a patient on anticoagulants presents with upper respiratory tract symptoms, the possibility of a hematoma should always be considered.

Key words: *warfarin, dysphagia, airway obstruction*

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INTRODUCTION

Warfarin is an anticoagulant medication commonly used in patients with mechanical valve replacement, those who have experienced ischemic cerebrovascular events, and patients with arrhythmias. Due to its narrow therapeutic range, overdose is frequently encountered. The most significant side effect of warfarin therapy is bleeding; its estimated incidence is 15–20% annually, with life-threatening and fatal bleeding rates reaching 1–3% per year (1). Bleeding due to anticoagulant overdose most commonly presents as intracranial bleeding, gastrointestinal bleeding, and genitourinary system bleeding (2).

Upper airway hematoma can occur as a result of various triggering events, such as cervical spinal cord injury, rheumatoid arthritis, neck surgery, major vascular injury, or sudden and severe head movements. Additionally, it may develop spontaneously in patients receiving anticoagulation therapy or those with bleeding diatheses. Although rare, upper airway hematoma is a very serious condition; however, in the literature, it is only reported in case reports with low levels of evidence (3).

This case report will present a patient who developed an upper airway hematoma secondary to warfarin therapy due to heart valve replacement.

CASE PRESENTATION

An 81-year-old female patient presented to our emergency department with complaints of difficulty swallowing and neck bruising for the past two days. During anamnesis, it was learned that the patient had no history of trauma, had a past medical history of hypertension, coronary bypass surgery, and aortic valve replacement, and was on warfarin therapy due to the aortic valve replacement. When the patient came to the emergency department, her vital signs were as follows: blood pressure: 100/70 mmHg, heart rate: 65 beats/min, and oxygen saturation: 94% on pulse oximetry. On physical examination, ecchymosis was observed on the anterior side of her neck, and oropharyngeal examination revealed a hematoma on the uvula. Other system examinations were unremarkable.Laboratory tests revealed an activated partial thromboplastin time (aPTT) of 157 seconds, while prothrombin time (PT) and INR levels were unmeasurably high. The patient was treated with intravenous vitamin K. A contrast-free neck CT scan showed "heterogeneous thickening in the soft tissues of both deep and superficial layers from the left lateral oropharynx to the glottic level, with significant narrowing of the airway at this level (mass or hematoma?)." The patient, who reported difficulty swallowing, was consulted with the otorhinolaryngology (ENT) clinic. Flexible endoscopic examination revealed narrowing at the rima glottidis, and the patient was admitted to the ENT ward. After a one-week follow-up, the patient was discharged with an adjusted warfarin dosage.

Figure 1. Oropharynx and neck hematoma

DISCUSSION

Bleeding related to oral anticoagulants, including warfarin, is a common and potentially life-threatening condition encountered in emergency departments. Warfarin inhibits vitamin K-dependent enzymes necessary for activating clotting factors II, VII, IX, and X. It has a half-life of 35 hours, and its anticoagulant effects last 3 to 5 days. The primary complication of anticoagulant therapy is bleeding, which may occur spontaneously or after minor trauma. A high INR (>4.5) is associated with an increased risk of bleeding (4).

Several risk factors are associated with anticoagulant-related bleeding, the most common being the level of anticoagulation measured by INR. Beyond the anticoagulation dose, factors influencing anticoagulation levels include diet, medical conditions, and medications. Dietary changes or vitamin K deficiency can affect INR levels. Conditions like liver dysfunction, fever, and hyperthyroidism can enhance warfarin's anticoagulant effect. Drugs such as trimethoprim-sulfamethoxazole, cephalosporins, metronidazole, cimetidine, disulfiram, thyroxine, clofibrate, erythromycin, and testosterone can also increase warfarin’s anticoagulant activity. Additionally, platelet inhibition via aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs) raises the risk of complications with warfarin therapy (5).

Bleeding associated with anticoagulant therapy can occur in the genitourinary and gastrointestinal systems, skin, central nervous system, nose, and retroperitoneum. Life-threatening bleeding most often presents as intracranial or gastrointestinal bleeding. Upper airway bleeding, while rare, is a potentially life-threatening complication of anticoagulant therapy (6). There are cases where the

submandibular, sublingual, para pharyngeal and retropharyngeal regions, arytenoids and vocal cords were affected in upper airway hematomas secondary to warfarin use (2).

According to a 2015 meta-analysis, the majority of upper airway hematomas due to warfarin overdose were identified in the sublingual (66.57%) and retropharyngeal (27.03%) regions, while supraglottic, laryngeal, lingual, and submandibular hematomas were less common (3). Symptoms of upper airway hematoma depend on the exact location of the bleeding and may range from a mild sore throat to severe laryngeal dyspnea. Even a sore throat should be taken seriously in patients receiving anticoagulation therapy. Physical examination may reveal ecchymosis on the neck, sublingual hematoma, palpable masses in the cervical region, and signs of respiratory depression (2). Case reports suggest that upper airway hematoma associated with anticoagulants can result from minor traumas such as excessive vocal use (crying, shouting, coughing) (6).

Upper airway hematoma secondary to anticoagulants is a life-threatening emergency. The main objectives of treatment are to prevent airway obstruction and rapidly correct coagulopathy. Reversal of anticoagulant therapy should be promptly achieved using vitamin K and fresh frozen plasma (6). Airway control through intubation or tracheotomy should be considered, but potential risks must be carefully evaluated. Prophylactic intubation or tracheotomy can be dangerous and challenging. Endotracheal intubation may cause hematoma rupture, leading to further airway compromise due to bleeding. Similarly, performing a tracheotomy in a patient on anticoagulation therapy poses a high bleeding risk. Altered anatomy due to hematoma may also hinder the successful performance of tracheotomy (7).

In summary, there is no consensus regarding airway management in such cases. Treatment to secure the airway should be tailored individually, considering presenting symptoms and findings, the timing of events, and the treating physician's level of comfort (5). In cases without airway compromise or hemodynamic instability, conservative management can be successfully implemented (8). In selected cases with large hematomas, surgical drainage of the hematoma may be considered (7).

CONCLUSION

The use of oral anticoagulants is a common condition encountered in emergency departments and can lead to life-threatening bleeding. A review of the literature reveals that oropharyngeal and glottic region hematomas are rarely reported. In emergency departments, the possibility of bleeding should always be considered in patients using warfarin, and their physical examinations should be conducted meticulously to carefully evaluate them for potential bleeding complications.

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