Evaluation of O rh-negative blood transfusion practices in emergency cases: A one-year study

Acil durumlarda O rh negatif kan transfüzyonu uygulamalarının değerlendirilmesi: Bir yıllık çalışma

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ABSTRACT

Objective: In conditions leading to hemorrhagic shock, the transfusion of erythrocyte concentrate (EC) may be necessary. The primary goal of transfusion is to reduce mortality caused by tissue hypoxia. In critically ill patients where time is of the essence, such as those with trauma or gastrointestinal bleeding, the administration of O Rh-negative EC without cross-matching can be life-saving. This study aims to evaluate the effectiveness of emergency O Rh-negative EC transfusion in patients with hemorrhagic shock by analyzing its impact on hemodynamic parameters, the need for surgical intervention, and patient outcomes. Additionally, it seeks to highlight the importance of O Rh-negative EC transfusion in gaining the necessary time for bleeding control.

Methods: This retrospective study was conducted in the Emergency Department of a tertiary hospital between June 1, 2023, and June 1, 2024.The study included 95 patients aged 18 years and older who received O Rh-negative EC transfusion without cross-matching. The patients' vital signs, complete blood count, biochemical and blood gas values, transfusion indications, surgical intervention rates, and 30-day mortality were recorded.

ÖZET

Amaç: Hemorajik şoka neden olan durumlarda eritrosit konsantresi (EK) transfüzyonuna ihtiyaç duyulabilmektedir. Transfüzyonun temel amacı, doku hipoksisi sonucu oluşabilecek mortaliteyi azaltmaktır. Travma veya gastrointestinal kanama gibi zamanla yarışılan kritik hastalarda, cross-match (çapraz karşılaştırma) testi yapılmadan 0 Rh negatif EK verilmesi hayat kurtarıcı olabilir. Bu çalışma, hemorajik şok gelişen hastalarda acil O Rh-negative EK transfüzyonunun etkinliğini; hemodinamik parametreler, cerrahi müdahale gereksinimi ve hasta sonuçları üzerindeki etkisini analiz ederek değerlendirmeyi amaçladı. Ayrıca, O Rh-negative EK transfüzyonunun kanama kontrolü için gerekli zamanı kazandırmadaki önemini vurgulamayı hedefledi.

Yöntem: Bu retrospektif çalışma; 1 Haziran 2023-1 Haziran 2024 tarihleri arasında üçüncü basamak bir hastanenin Acil Servisinde yürütüldü. Çalışmaya, cross-match yapılmadan O Rh-negatif EK transfüzyonu yapılan, 18 yaş ve üzerindeki 95 hasta dahil edildi. Hastaların vital bulguları, hemogram, biyokimya ve kan gazı değerleri, transfüzyon nedenleri, cerrahi

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In my hospital, the preparation of erythrocyte concentrate with a cross-match test takes an average of 60-90 minutes, whereas the preparation of O Rh-negative EC without cross-matching is completed in a significantly shorter time, approximately 5-20 minutes.

Results: Among the patients, 72% (n=68) were male, and the most common indication for transfusion was trauma (69.5%), followed by gastrointestinal bleeding (24.2%). The most frequent trauma-related causes were liver injuries (n=20) and extremity injuries (n=17). Endotracheal intubation was performed in 64% of the patients, 63% underwent emergency surgery, and 82% were admitted to the intensive care unit. The mortality rate in the emergency department was 16%, while the overall mortality rate was found to be 56%. A significant relationship was found between mortality and systolic blood pressure, diastolic blood pressure, Glasgow Coma Scale score, and lactate levels (p=0.022, p=0.001, p<0.001, p<0.001). Additionally, higher International Normalized Ratio (INR) values and lower platelet counts were significantly associated with survival status (p=0.01, p=0.002).

Conclusion: The transfusion of O Rh-negative EC was found to provide critical time before surgical intervention and improve survival in patients with trauma and gastrointestinal bleeding. It is suggested that initiating blood transfusion during the pre-hospital period may further reduce mortality rates. This study is expected to contribute to the establishment of a database for the appropriate and effective use of blood and blood products.

Key Words: Emergency transfusion, O Rh-negative erythrocyte concentrate, hemorrhagic shock, trauma, gastrointestinal bleeding

müdahale oranları ve 30 günlük mortalitesi kayıt edildi. Hastanemde cross-match testi ile EK hazırlanması ortalama 60-90 dakika sürerken, cross-match yapılmadan O Rh-negatif EK hazırlanması 5-20 dakika gibi daha kısa bir sürede gerçekleştirilmektedir.

Bulgular: Hastaların %72'si (n=68) erkek, %28'i (n=27) kadın idi. En sık transfüzyon nedeni travma (%69,5) olup, bunu gastrointestinal kanamalar (%24,2) takip etti. Travmaya bağlı en yaygın nedenler ise karaciğer (n=20) ve ekstremite (n=17) yaralanmaları olarak saptandı. Hastaların %64'ü entübe edildi, %63'ü acil cerrahiye alındı ve %82'si yoğun bakıma yatırıldı. Acil serviste ölüm oranı %16, toplam mortalite oranı ise %56 olarak tespit edildi. Sistolik ve diyastolik kan basıncı, Glasgow Koma Skalası skoru ve laktat düzeyleri ile mortalite arasında anlamlı bir ilişki bulundu (p=0,022, p=0,001, p<0,001, p<0,001). Ayrıca, yüksek Uluslararası Normalleştirilmiş Oran (INR) değerleri ve düşük platelet sayıları ile sağ kalım arasında istatistiksel olarak anlamlı bir ilişki saptandı (p=0,01, p=0,002).

Sonuç: O Rh-negatif EK transfüzyonunun, travma ve gastrointestinal kanamalı hastalarda cerrahi müdahale öncesinde kritik zaman kazandırdığı ve sağ kalımı artırdığı tespit edildi. Hastane öncesi dönemde başlatılacak kan transfüzyonunun mortalite oranlarını daha da azaltabileceği düşünülmektedir. Bu çalışmanın, kan ve kan ürünlerinin doğru ve etkili kullanımına yönelik bir veri tabanı oluşturulmasına katkı sağlaması beklenmektedir.

Anahtar Kelimeler: Acil transfüzyon, O Rh-negatif eritrosit konsantresi, hemorajik şok, travma, gastrointestinal kanama

INTRODUCTION

EC has been a part of anemia treatment strategies for many years. Approximately 40% of critically ill patients receive blood transfusions during hospitalization. Particularly, blood transfusion due to aging, critical illnesses, trauma, and surgical indications is considered a predictor of poor outcomes (1). In acute hemorrhage, blood loss exceeding 1500 mL typically necessitates transfusion. The primary goal of transfusion is to prevent adverse outcomes associated with tissue hypoxia (2). The most common indications for emergency transfusion include trauma, gastrointestinal bleeding (GIB), and hemorrhages due to warfarin overdose (3). Trauma is the third leading cause of death, and hemorrhagic shock is a major cause of mortality, particularly in the early hours of trauma (4). In patients who do not respond to fluid resuscitation and have a shock index exceeding 0.9, early blood transfusion should be considered (5). Timely EC transfusion in trauma patients with active bleeding can provide critical time for surgical intervention and improve survival. This period is recommended to be approximately 10 minutes. For every minute of delay in transfusion, the 30-day mortality rate increases by 5% (6). In GIB, another cause of hemorrhagic shock, the hemoglobin threshold for EC transfusion is determined based on the presence of cardiovascular disease (CVD). In patients with CVD, the target hemoglobin (Hgb) level is to increase it to 10 g/dL or above if Hgb is ≤8 g/dL. In the absence of CVD, the threshold for EC transfusion is Hgb ≤7 g/dL, with the desired hemoglobin range being 7–9 g/dL. However, in unstable patients, a flexible transfusion strategy is applied instead of a fixed threshold value (7). Rational EC transfusion in acute blood loss is of great importance in terms of mortality and morbidity. High-volume blood transfusion has been found to be associated with increased mortality, as well as prolonged hospital and intensive care unit stays. Studies have shown that as the transfusion rate increases, mortality rates also rise (8).

The primary aim of this study is to assess the clinical impact of emergency O Rh-negative EC transfusion in patients with hemorrhagic shock. Specifically, i aimed to evaluate the relationship between transfusion and changes in hemodynamic stability, the need for surgical intervention, intensive care unit admission rates, and short-term mortality. My secondary objective is to highlight the importance of O Rh-negative EC transfusion in gaining the necessary time for surgical interventions and endoscopic procedures required for bleeding control.

MATERIAL and METHOD

This study was designed as a single-center, retrospective study conducted at the Emergency Department of Ankara Etlik City Hospital. Patients aged 18 years and older, both male and female, who received O Rh-negative EC transfusion without cross-matching in the emergency department between June 1, 2023, and June 1, 2024, were included in the study. All patients under 18 years of age, pregnant women, those who had received any blood transfusion within the last month, and patients with insufficient data required for the study were excluded. During the study period, a total of 108 patients received O Rh-negative EC transfusion without cross-matching. However, six patients were excluded after cross-matching confirmed that their actual blood type was O Rh-negative, and seven patients were excluded due to missing parameters. Consequently, a total of 95 patients were included in the study.

All patient data were obtained from the hospital database and patient records. The parameters analyzed in the study included sociodemographic characteristics (age, sex, and comorbidities), vital parameters [systolic and diastolic blood pressure, body temperature, heart rate, respiratory rate, and peripheral oxygen saturation (SpO_2)], and consciousness status assessed by the Glasgow Coma Scale (GCS). Complete blood count (CBC) values, including white blood cell, lymphocyte, neutrophil, monocyte, Hgb, hematocrit (Htc), and platelet count, were recorded. Biochemical parameters such as glucose, blood urea nitrogen (BUN), creatinine, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and sodium levels were also analyzed. Blood gas parameters, including pH, SpO_2, partial oxygen pressure (PaO_2), partial carbon dioxide pressure ($PaCO_2$), bicarbonate (HCO_3), and lactate levels, were evaluated. Additionally, coagulation parameters such as activated partial thromboplastin time (aPTT) and INR were documented. The imaging studies performed, including X-ray, ultrasonography, and computed tomography (CT), were also recorded. The indications for transfusion (diagnosis and reason), the number of O Rh-negative EC units transfused, hospitalization status, and 30-day mortality were documented.

Recent trauma guidelines recommend avoiding aggressive fluid replacement in the management of hemorrhagic shock. Instead, permissive hypotension is advocated for these patients. Following the administration of 1000 mL of isotonic fluid replacement in the pre-hospital and emergency department settings, EC transfusion is recommended (5). The patients included in the study received 100 to 500 mL of isotonic solution in the pre-hospital period, while the total amount of isotonic fluid administered in the emergency department was limited to 1000 mL.

According to the classification of hemorrhagic shock, Class 1 hemorrhage triggers a mild systemic response and indicates blood loss of less than 15% of total blood volume. Class 2 hemorrhage occurs when blood loss ranges between 15% and 30%, leading to the activation of compensatory mechanisms. Sympathetic activation leads to tachycardia. In Class 3 hemorrhage, at least 30% blood loss occurs, resulting in tissue hypoxia, increased lactate levels, and base excess. Patients experience reduced urine output. When blood loss exceeds 40%, it is classified as Class 4 hemorrhage. At this stage, urine output ceases, severe hypotension and tachycardia develop, ultimately leading to multiple organ failure (9).

The hospital setting, the cross-match test in blood transfusion aims to prevent hemolytic transfusion reactions by detecting alloantibodies in the recipient's red blood cells (against AB0, D and other antigens) that may react with corresponding antigens on donor red blood cells. When no complex serological issues were present, the routine cross-match test typically took between 30 and 60 minutes. Additionally, the process of drawing the patient's blood for cross-matching and transporting it to the blood bank required at least an additional 30 minutes. Considering these factors, the total preparation time for a compatible transfusion was at least 60 to 90 minutes. In contrast, the preparation and administration of O Rh-negative EC without cross-matching took approximately 5 to 20 minutes.

The analysis of the research data was conducted using the SPSS 22 (Statistical Package for Social Science; SPSS Inc., Chicago,IL) package programe, and quantative data were given as percentages and the qualitative data as mean±standart deviation and median.Mann Whitney U tests were used to compare independent variables. Two tailed Pearson Corelation test were used to compare mortality between study parameters. The results were expressed as 95% confidence interval and p<0.05 as significant.

The study was approved by the Ankara Etlik City Hospital Scientific Researches Ethics Committee (Date: 25.09.2024 and Number: AESH-BADEK-2024-891).

RESULTS

Of the 95 patients included in the study, 72% (n=68) were male, and 28% (n=27) were female. The mean age of male patients was 42.3 ± 19.9 years (min-max: 18–88), while the mean age of female patients was 47 ± 20.2 years. No comorbidities were present in 85.3% of male patients and 63% of female patients. CVD was the most common comorbidity in both sexes. The most common indication for emergency O Rh-negative EC transfusion was trauma, accounting for 69.5% (n=67) of cases, followed by GIB at 24.2% (n=22). Among trauma-related causes, liver injury was the most frequent indication (n=20), followed by extremity injury (n=17). Other trauma-related transfusion indications included splenic injury (n=11), thoracic injury (n=9), pelvic injury (n=8), and renal injury (n=2), respectively. A total of 64.2% of the patients were intubated, and 63.1% underwent emergency surgical intervention. Additionally, 82.1% of the patients were admitted to the intensive care unit (Table 1). Regarding medication use, 82% (n=78) of the patients were not on any medications.

Table 1. Bleeding sources distribution of the patients

Variable	n (95)	%
Comorbidities		
None	75	79
Hypertension	2	2.1
Cardiovascular Disease	8	8.45
Cerebrovascular Disease	2	2.1
Liver Disease	2	2.1
Malignancy	3	3.1
Gastritis	2	2.1
Bleeding Diathesis	1	1.05
Emergency Surgery		
Yes	60	63.1
No	35	36.9
Intubation		
Yes	61	64.2
No	34	35.8
Hospitalization		
Ward	2	2.1
Intensive Care	78	82.1
Emergency Death	15	15.8
Bleeding Site		
Gastrointestinal Bleeding	22	24.2
Trauma	67	69.5
Aortic Dissection	4	4.2
Urinary System	1	1.05
Vaginal Bleeding	1	1.05

Acetylsalicylic acid was used by 7% (n=7), warfarin by 3% (n=3), and direct oral anticoagulants by 7% (n=7). In the emergency department, 16% of the patients died, while the overall mortality rate was 56% (n=53). A total of 67% (n=64) of the patients were classified as having Class 3 hemorrhagic shock, whereas 33% (n=31) were in Class 4 hemorrhagic shock. Regarding EC transfusions, 27 patients received 1 unit, 30 patients received 2 units, 12 patients received 3 units, 19 patients received 4 units, and 7 patients received 5 units. Fresh frozen plasma (FFP) transfusion was administered to 57 patients, with 51 receiving 1 unit and 6 receiving 2 units. A total of 38 patients did not receive FFP transfusion.

The initial blood pressure, pulse rate, blood gas, biochemical, and CBC results of the patients upon arrival at the emergency department are summarized in Table 2. When analyzing the correlation between patients' vital signs, blood values, and mortality, a moderate negative correlation was observed between systolic and diastolic blood pressure and mortality. Similarly, lactate and HCO_3 levels showed a moderate negative correlation with mortality (Table 3).

Table 2. Results of the patients vital signs and blood tests

Variable (n=95)	**Mean±SD**	**Min-Max**
Systolic Blood Pressure (mmHg)	82.34±17.11	50-198
Diastolic Blood Pressure (mmHg)	51.77±12.15	30-98
Pulse (beats per minute)	110.37±26.19	25-145
pH	7.13±0.21	6.2-7.5
Partial Pressure of Carbon (mmHg)	46.80±18.20	19-112
Partial Pressure of Oxygen) (mmHg)	41.14±21.80	16-211
Bicarbonate (mmol/L)	14.66±5.34	4.7-31
Lactate (mmol/L)	7.24±3.81	2-21
Glucose (mg/dL)	178.01±85.91	5.4-604
Urea (mg/dL)	48.73±45.77	9.8-227
Creatinine (mg/dL)	1.40±0.73	0.6-5.5
Aspartate Aminotransferase (U/L)	170.25±244.17	5-1310
Alanine Aminotransferase (U/L)	146.63±227.33	5-1457
Sodium (mmol/L)	139.97±5.53	125-159
Potassium (mmol/L)	4.25±0.95	1.2-6.2
aPTT (seconds)	45.55±35.58	21-245
INR	2.58±3.93	0.9-28
Hemoglobin (g/dL)	8.76±2.44	3.3-14
Hematocrit (%)	27.88±7.55	11-47.8
White Blood Cell (×10^3/µL)	17.1±8.1	8.7-39.1
Platelet (×10^3/µL)	193.47±90.30	30-45.9

aPTT: Activated Partial Thromboplastin Time, INR: International Normalized Ratio

When examining the relationship between patient parameters and mortality, a significant association was found between systolic blood pressure ($p<0.001$), diastolic blood pressure ($p<0.001$), and GCS score ($p<0.001$). Additionally, lactate levels ($p<0.001$) and Hgb levels ($p=0.033$) were significantly associated with mortality. The relationship between mortality and other patient parameters is summarized in Table 4.

Table 3. Correlation between the patients vital signs, blood parameters and mortality

Variable	Pearson's r*	p
Age (years)	0.179	0.083
Systolic Blood Pressure (mmHg)	-0.235	0.022
Diastolic Blood Pressure (mmHg)	-0.325	0.001
Pulse (beats/min)	-0.23	0.025
Saturation (%)	-0.239	0.02
Temperature (°C)	-0.057	0.584
Glasgow Coma Scale	-0.475	<0.001
Erythrocyte Suspension (units)	0.19	0.065
Fresh Frozen Plasma (units)	-0.031	0.769
pH	-0.451	<0.001
Partial Pressure of Carbon (mmHg)	0.33	0.001
Partial Pressure of Oxygen) (mmHg)	0.102	0.323
Bicarbonate (mmol/L)	-0.402	<0.001
Lactate (mmol/L)	0.403	<0.001
Glucose (mg/dL)	0.026	0.804
Urea (mg/dL)	0.195	0.059
Creatinine (mg/dL)	0.155	0.134
AspartateAminotransferase (U/L)	0.075	0.47
Alanine Aminotransferase (U/L)	0.111	0.283
Sodium (mmol/L)	0.277	0.007
Potassium (mmol/L)	0.39	<0.001
aPTT (seconds)	0.235	0.022
INR	0.035	0.743
Hemoglobin (g/dL)	-0.142	0.171
Hematocrit (%)	-0.155	0.133
White Blood Cell (×10^3/μL)	0.009	0.935
Platelet (×10^3/μL)	-0.306	0.003

* Two-tailed Pearson's Corelations test, aPTT: Activated Partial Thromboplastin Time, INR: International Normalized Ratio

Table 4. Analysis of parameters grouped by mortality

Groups			
Variable	**Live** (n=53)	**Death** (n=42)	**p***
Age (years)	40.41±18.45	47.59±21.39	0.122
Systolic Blood Pressure (mmHg)	85.90±10.09	77.85±22.48	<0.001
Diastolic Blood Pressure (mmHg)	55.28±9.70	47.35±13.55	<0.001
Pulse (beats/min)	115.71±15.23	103.64±34.58	0.339
Glasgow Coma Scale	12.83±2.79	9.38±3.65	<0.001
pH	7.22±0.14	7.02±0.24	<0.001
Partial CO2 (mmHg)	41.48±12.62	53.51±21.79	0.007
Partial O2 (mmHg)	39.16±10.93	43.63±30.44	0.802
Bicarbonate (mmol/L)	16.57±4.72	12.26±5.17	<0.001
Lactate (mmol/L)	5.88±2.55	8.96±4.44	<0.001
Glucose (mg/dL)	176.05±83.39	180.48±89.94	0.961
Urea (mg/dL)	40.85±40.86	58.69±50.03	0.004
Creatinine (mg/dL)	1.30±0.77	1.52±0.65	0.009
Aspartate Aminotransferase (U/L)	154.01±227.84	190.73±264.72	0.078
Alanine Aminotransferase (U/L)	124.20±184.53	174.92±271.71	0.059
Sodium (mmol/L)	138.62±4.52	141.69±6.22	0.018
Potassium (mmol/L)	3.92±0.82	4.67±0.96	<0.001
aPTT (seconds)	38.14±35.51	54.90±33.81	<0.001
INR	2.43±3.28	2.78±4.66	0.01
Hemoglobin (g/dL)	9.19±2.29	8.23±2.54	0.033
Hematocrit (%)	28.92±6.74	26.57±8.36	0.085
White Blood Cell (×10^3/μL)	17±8.27	17.2±8.05	0.843
Platelet (×10^3/μL)	21.8±8.57	16.26±8.72	0.002

* Mann Whitnet U tests, aPTT: Activated Partial Thromboplastin Time, INR: International Normalized Ratio

DISCUSSION

This study demonstrated the relationship between vital signs, blood parameters, and mortality in patients who received emergency O Rh-negative EC transfusion after developing hemorrhagic shock. Blood pressure, consciousness level, and blood gas measurements were found to provide significant data in the patient group with fatal outcomes.

Upon analyzing the data from this study, it was observed that the need for O Rh-negative EC transfusion was more common among male patients and those in their fourth decade of life. The majority of patients had no comorbidities and were not on any regular medication. The most frequent indication for transfusion was trauma-related blood loss, followed by GIB as the second most common cause. In this study, the vast majority of patients requiring O Rh-negative EC transfusion belonged to these two groups. While trauma was the most common cause of hemorrhagic shock, GIB was the second most frequent cause. Trauma is one of the leading causes of death worldwide, with approximately half of these patients succumbing to hemorrhage. Additionally, trauma is the most significant cause affecting individuals aged 1 to 44 years. A study has shown that more than 62% of patients who received blood transfusions did so due to trauma (10). These findings are consistent with the results of this study. Hemorrhagic shock is one of the leading preventable causes of death in trauma. The primary approach to managing trauma-related bleeding is achieving hemostasis at the bleeding site. However, to mitigate the adverse effects of hemorrhagic shock and gain time until surgical intervention can be initiated, blood transfusion is recommended (11). In this study, more than half of the patients with hemorrhage underwent emergency surgical intervention. Additionally, a significant number of patients died in the emergency department. To reduce hemorrhage-related mortality in the emergency setting, pre-hospital blood transfusion is increasingly being implemented (12). Some military units have adopted this approach in combat zones to improve survival rates (13). The absence of pre-hospital blood transfusion in Turkey suggests that it may not effectively prevent the worsening of hemorrhagic shock before hospital admission. All patients included in the study were classified as stage 3 or 4 hemorrhagic shock. Trauma guidelines recommend allowing permissive hypotension and avoiding high-volume fluid therapy for shock management. In patients who do not respond to fluid resuscitation, early initiation of blood transfusion is advised (14). Studies have shown that aggressive fluid replacement disrupts the coagulation cascade, leading to worsening shock. Since it does not reduce mortality, restricted crystalloid fluid administration is recommended (15). GIB is a major cause of mortality and morbidity. Hemorrhagic shock due to GIB is among the common indications for blood transfusion. Currently, a restrictive transfusion strategy is preferred (16). In this study, patients who received blood transfusion due to GIB were consistent with the literature. To reverse hemorrhagic shock and facilitate urgent endoscopy, O Rh-negative EC transfusion was rapidly administered. As blood pressure decreases in hemorrhagic shock, the severity of shock and, consequently, the risk of death increase exponentially. Hypotension leads to reduced organ perfusion, potentially resulting in multiple organ failure and death (17). Studies aimed at mitigating this condition have shown that initiating blood transfusion in the pre-hospital setting can reduce mortality by 10% (18). In this study, a negative relationship between hypotension and mortality was also observed. The administration of emergency O Rh-negative EC transfusion did not sufficiently reduce mortality in the emergency department. The prolonged transport time of patients with acute bleeding and their presentation in stage 3-4 shock upon arrival are considered significant factors contributing to increased emergency department mortality rates. Prehospital fluid replacement and blood transfusion have not demonstrated a clear difference in preventing organ failure to mitigate this risk. However, mortality was found to be 7% lower in the group that received blood transfusion (19). Deterioration in consciousness may occur earlier than hypotension and tachycardia and is associated with mortality. At this stage, the patient may already be in an advanced phase of shock. Additionally, the metabolic changes induced by shock can contribute to this impairment (20). In this study, a decrease in GCS score was associated with an increase in patient mortality. Additionally, worsening acidosis was found to be linked to higher mortality. Lactic acidosis also demonstrated a positive correlation with mortality. This process develops due to inadequate oxygen delivery to tissues as a result of reduced blood volume. In response to oxygen deficiency, tissues shift to anaerobic metabolism, leading to the development of lactic acidosis (21). The effects of hypoperfusion, heat loss, and acidosis in hemorrhagic shock are collectively known as the lethal triad. This process can subsequently lead to coagulopathy. Prolonged coagulation times have been found to be directly associated with mortality. Although genetic factors are thought to contribute to this condition, hypoperfusion and the activation of the protein C system also play a significant role. While coagulation factors are activated to stop bleeding, an opposing mechanism simultaneously functions to prevent abnormal thrombus formation in intact tissues (17,22). In this study, a significant relationship was found between coagulopathy and mortality in patients. Both an increase in INR and a decrease in platelet count can be explained by the pathophysiology of coagulopathy in hemorrhage. Additionally, the fact that the patients included in the study were in stage 3-4 shock and a pre-arrest state accounts for the observed coagulation and platelet abnormalities. Despite this, rapid O Rh-negative EC transfusion and emergency intubation enabled 63% of the patients to undergo surgery. Similarly, most GIB patients received urgent endoscopic treatment. I believe that these interventions contributed to improved survival. My emergency department is a major center with rapid access to a blood bank. Emergency radiological imaging, interventional procedures, and surgical teams are always readily available. This management system not only facilitates the care of critically ill patients but also has a positive impact on survival. In this study, a significant relationship was found between decreased hemoglobin levels and mortality. This finding underscores the necessity of rapid EC transfusion. I believe that patients experiencing acute blood loss undergo an average blood loss of 30% or more in the pre-hospital period. The primary reason for this is that our patients presented in stage 3 and 4 hemorrhagic shock. This condition can be explained by the development of hyperlactatemia and coagulopathy in patients who did not survive. Hemoglobin, another indicator of bleeding, may not always exhibit a direct correlation with blood loss. However, a decrease in hemoglobin levels can serve as a crucial indicator of the rate at which fluid is drawn from the tissues (23). Elevated lactate levels are a key indicator of tissue hypoxia. High lactate concentrations reflect impaired oxygen delivery and, consequently, significant blood loss (23, 24). Although massive transfusion was not performed in my study, FFP transfusion was applied to a significant portion of patients. The role of FFP in hemorrhagic shock management has been well-documented, particularly in massive transfusion protocols. However, its use in non-massive transfusion settings remains a subject of debate.

The limitations of my study include its retrospective design and being a single-center study, which restricts the generalizability of the results. However, the strengths of this study include being a large medical center, receiving continuous patient referrals, the high patient volume brought in by the emergency ambulance system, and functioning as a trauma center. Another limitation of this study was the inability to access complete pre-hospital data. The onset time of the event and pre-hospital interventions may have influenced patient outcomes.

I included only patients who received emergency O Rh-negative EC transfusion in my study. Although this reduced the overall study dataset, my primary aim was to evaluate the outcomes of using this critical blood product and to identify the parameters guiding the decision for its administration. The lack of comparison between pre- and post-transfusion values in patients may be considered a limitation. However, this can be explained by several factors: some patients who received emergency EC transfusion required urgent surgical intervention, some experienced cardiac arrest and died in the emergency department, while others had altered transfusion requirements following emergency endoscopic procedures. Additionally, differences in transfusion indications, variations in transfusion volumes, inconsistencies in surgical durations, and diverse treatment regimens would have compromised the homogeneity of the patient group. This issue would have significantly impacted the analysis of pre- and post-transfusion values. Additionally, the lack of a standardized time frame for obtaining post-transfusion control blood values and the uncertainty regarding laboratory processing times were major limitations of the study. Due to these constraints, comparing pre- and post-transfusion values in a retrospective study was methodologically unfeasible. The strength of this study lies in its comprehensive presentation of emergency department data from patients who received emergency O Rh-negative EC transfusion. The difficulty in collecting data from such patient groups highlights the need for more extensive data in the literature. In this regard, the study contributes to the establishment of a database for the appropriate and effective use of blood and blood products, reflecting one of its key strengths.

In conclusion; this study demonstrated that nearly all patients with stage 3-4 hemorrhagic shock required emergency intubation, surgical intervention, or interventional procedures to control bleeding. However, despite these interventions, slightly more than half of the patients did not survive. I believe that emergency O Rh-negative EC transfusion can provide a significant time advantage for surgical and endoscopic procedures. Thus, i consider that it contributes to improved survival. Furthermore, i assess that initiating transfusion in the pre-hospital setting could further increase survival rates. Vital signs and rapid blood gas analysis provide key indicators for predicting mortality.

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ETHICS COMMITTEE APPROVAL

* The study was approved by the Ankara Etlik City Hospital Scientific Researches Ethics Committee (Date: 25.09.2024 and Number: AESH-BADEK-2024-891).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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