

Incidence of Infections in Transfused Burn Patients: A 5-Year Single-Institution Experience

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ABSTRACT

OBJECTIVES: Transfusion has been associated with infections in many disease states. Patients with severe burn injuries have major transfusion requirements. In this study, we aimed to determine the incidence of infections in burn patients who underwent transfusion.

MATERIALS AND METHODS: We conducted a descriptive, retrospective, and cross-sectional study. We reviewed the medical records of 179 male and female patients, over 18 years of age, who required blood transfusions as a result of burn injuries. Demographic and relevant clinical data were collected from medical records.

RESULTS: Of 179 burn patients, 112 were male patients (62.57%). The mean age was 46.08 ± 5.05 years (range, 18-72 years), and the median age was 54 years. Patients between the ages of 48 and 57 years represented 25.14% of the sample. Almost half of the patients required transfusion (49.72%), and packed red blood cells was the most used blood product (30.72%). Overall, 52 transfused patients (29.04%) had major infectious complications, defined as invasive burn wound infection or pneumonia.

CONCLUSIONS: The incidence of infections in hospitalized burn patients who underwent transfusions at our center between 2015 and 2019 was low. Blood transfusion remains a highly effective and potentially lifesaving treatment for many patients.

KEY WORDS: *Fresh frozen plasma, Packed red blood cells, Thermal injuries, Transfusion of blood products*

INTRODUCTION

Although potentially lifesaving, blood transfusions are not benign interventions, and they are also limited and expensive. Blood transfusion has become ubiquitous in patients with severe burns since they have major transfusion requirements secondary to surgery-related blood loss, serial extraction of blood by venipuncture, decreased hematopoiesis, and increased hemolysis.^{1,2}

Packed red blood cells are the most common blood product used for transfusions.² An acceptable strategy for transfusion in burn patients has not been well established. Blood product transfusions in addition to several other factors, such as age, total body surface area (TBSA) of the burn, and inhalation injury, have been associated with an increase in mortality and infection.³⁻⁵

Infection is a leading contributor to morbidity and mortality in patients with burn injuries. Patients with severe burns are by definition immunosuppressed; loss of the cutaneous barrier allows direct microbial invasion; in addition to physical factors, the physiological response generated by the injury also increases the risk of infection.^{1,2,6} Each transfusion increases the risk of infection up to 11%.^{1,2} Hence, reducing blood loss and the need for blood transfusions is part of effective care. It is also extremely important to determine the right time to transfuse, perform early excisions, and cover the lesions to reduce the risk of infection. Several studies have suggested that blood transfusions could adversely affect the clinical outcomes of patients with severe burns.^{1,2,7} Therefore, we aimed to determine the incidence of infections in burn patients after the administration of blood products at the Department of Aesthetic, Plastic, Reconstructive and Maxillofacial Surgery of the Military Hospital “Dr. Carlos Arvelo” (Caracas, Venezuela) from January 2015 to December 2019.

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MATERIALS AND METHODS

For our analyses, we conducted a descriptive, retrospective, and cross-sectional study. The protocol was approved by the corresponding ethics committee in accordance with the ethical guidelines of the 1975 Helsinki Declaration. We obtained informed consent from the patients or surrogates and proceeded to review the medical records. Our study included 179 male and female patients, 18 years and older, who presented with burns and required blood transfusions as part of the treatment at our hospital from January 2015 to December 2019. Patients who did not receive blood transfusions, pregnant women, and patients with incomplete medical records were excluded. Demographic and relevant clinical data were collected from the medical records. Collected data were entered in a software package for further analyses. The database was checked for errors and corrected in such a way to maintain the patient's confidentiality without including any sensitive details. Simple descriptive statistics were generated to summarize distributions and proportions on study variables. Data were described using percentages.

RESULTS

Of 179 burn patients admitted to our hospital and who received at least 1 blood transfusion during their hospital stay, 112 were men (62.57%). The mean age was 46.08 ± 5.05 years (range, 18-72 years), and the median age was 54 years. Patients between the ages of 48 and 57 represented 25.14% of the study sample.

The most frequent comorbidities were hypertension (18.44%) and diabetes mellitus (15.64%). Two patients had a history of autoimmune disorder, 6 patients had asthma, and 61.45% of patients reported no personal medical history. In 72.62% of the study patients, the family history was not pertinent. Of 179 patients, 138 (77.09%) experienced burn injuries involving <20% of TBSA. Degree of burn was classified into first, second, third, and mixed, with 46.37% of patients having mixed-degree burn injuries and 7.26% of patients having third-degree burn injuries. Almost half of the patients required transfusion (49.72%), and packed red blood cells was the most used blood product (30.72%). The second most common prescribed blood product among our study patients was fresh frozen plasma (13.40%). Overall, 52 patients with transfusion (29.04%) had major infectious complications, defined as invasive burn wound infection or pneumonia.

DISCUSSION

Blood and its derivatives are not an absolutely safe prescription, but they are one of the most lifesaving products in modern medicine. They play an important role in the

treatment of patients with severe burns, mainly because this population is susceptible to anemia for different reasons. However, the risk of infection is magnified in this population.

The demographic variables in our study differed from what is classically described in the literature. Although most of our study population were men, and burn injuries can occur at any age, our population was older than what has been reported.⁵ However, the study population included those in the labor force; thus, it is necessary to strengthen safety education to reduce the incidence of burns. The use of blood transfusions in the treatment of major burn injuries reported here also differed from previous reports. In a recent study on patients with burns between 15% to 65% TBSA, 71.9% of patients received packed red blood cells.² In our study, all hospitalized patients with burn injuries were included and 30.72% received packed red blood cells, and most of these patients experienced burn injuries involving <20% TBSA.

TABLE 1. General Characteristic of Patients

Variable	Number of Patients	Percent
Age group, years		
18-27	30	16.76
28-37	22	12.29
38-47	29	16.20
48-57	45	25.14
58-67	33	18.44
>67	20	11.17
Sex		
Female	67	37.43
Male	112	62.57
Comorbidity		
Hypertension	33	18.44
Diabetes	28	15.64
Asthma	6	3.35
Autoimmune disease	2	1.12
None	110	61.45
Degree of burn		
Second degree	83	46.37
Third degree	13	7.26
Mixed	83	46.37
Percent of total body surface area		
≤20	138	77.09
>20	41	22.91
Blood transfusion		
Yes	89	49.72
Packed red blood cells	55	30.72
Fresh frozen plasma	24	13.41
Platelets	10	5.59
No	90	50.28
Infection		
Yes	52	29.05
No	127	70.95

Our institution does not follow a standardized blood restriction protocol, but blood-conserving techniques have been used in our practice in recent years. Old guidelines recommended maintaining a hematocrit above 0.30 (30%) in all patients, but this recommendation is in disuse nowadays, and transfusion for anemia is not generally indicated unless the hemoglobin level is less than 70 g/L (7 g/dL) and hematocrit is less than 0.21 (21%), with some exceptions, such as in those patients who require higher levels of hemoglobin to increase oxygen-carrying capacity. However, multicenter studies have shown that a restrictive transfusion strategy does not decrease the incidence of bloodstream infections or any other infectious complications compared with liberal strategies but reduces transfusion volume and results in significant cost savings.^{5,8,9} Our study has several limitations. First, our study was a single-center retrospective study with a small sample size. Another major limitation was that our transfusion protocol is not standardized. Although our study provided data on the total number of transfusions, there was no direct evidence that blood transfusions were the sole cause of infection because the data did not include the time course, the number of blood transfusions received per patient, and/or the reasons for administering the transfusions.

CONCLUSIONS

The incidence of infections in hospitalized burn patients requiring transfusion in our center between 2015 and 2019 was low. Monitoring time trends in infectious disease rates in the blood donor population can provide a mechanism to assess the safety of the blood supply and the effectiveness of donor deferral criteria and other screening measures. To date, no standard of care exists for blood transfusions in patients with burns. The use of blood transfusions in the treatment of patients with major burn injury should be reserved for patients with a demonstrated physiologic need since the administration of blood products has been

associated with an increased risk of infection and immunosuppression. A further compromised immune system by blood transfusion may subsequently increase the patient's susceptibility to infection.

Although our population may not be representative of patients seen in all burn centers, the results obtained can be used to improve resource allocation of blood products and to establish a benchmark to guide future transfusion-related studies to improve clinical practice, to reduce transfusion volume, and to reduce health care costs.

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