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Original article

Blood transfusion in burn patients: Triggers of transfusion in a referral burn center in Iran

La transfusion sanguine chez les patients brûlés : les déclencheurs de transfusion dans un centre de référence des brûlés en Iran

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Abstract

Objectives. – Blood and its derivatives are one of the most lifesaving products in the modern medicine practice. However, it is not an absolutely safe prescription. Many adverse effects such as infection, transfusion-related acute lung injury, immunosuppression, multi-organ dysfunction, acute respiratory syndrome, transfusion errors, transmission of infectious agents such as HIV, HBV, HCV are attributable to blood transfusion. The aim of this study was to describe how and when blood products were transfused in a referral burn center.

Patients and methods. – This cross-sectional study was performed on medical records of all admitted patients in the Department of Burns and Reconstructive Surgery of Imam Reza Hospital, Mashhad, Iran during September 2014 up to August 2015. Transfusion measures such as Hb, Hct and demographic data were extracted from patient records. SPSS version 11.5 was used for data analysis.

Results. – During the study period, 701 acute burnt patients were admitted with the mean age of 25.5 ± 20.5 years. Sixty-four percent were male and burnt percentage of total body surface area (TBSA) was $30.9 \pm 24.3\%$. About one third (240) of patients received at least one blood product. Mean of the transfused packed red blood cell was 274.1 ± 674.6 mL per patient and 8.85 mL per 1% of burnt TBSA. Anemia was the most common transfusion trigger.

Conclusion. – Mortality in burnt patients who received blood products was two folds more than patients who did not receive any blood products. We prescribed less blood products compared with other reviewed burn centers. However, following a written blood transfusion protocol by all clinicians may reduce blood transfusion in unnecessary situations even more significantly.

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Keywords: Blood transfusion; Burn; Transfusion triggers; Packed red blood cell

Résumé

Objectifs. – Le sang et ses dérivés sont parmi les produits de sauvetage dans la pratique de la médecine moderne. Cependant, la transfusion sanguine n'est pas une prescription absolument sûre. Il existe de nombreux effets nocifs attribuable à une transfusion sanguine comme l'infection, l'œdème pulmonaire lésionnel post-transfusionnel, l'immunosuppression, le syndrome de défaillance multiviscérale, le syndrome respiratoire aigu, les erreurs transfusionnelles, la transmission des agents infectieux comme le virus d'immunodéficience humaine (VIH), l'hépatite B (HBV) et l'hépatite C (HCV). Le but de cette étude est d'enquêter sur la transfusion sanguine dans un centre de référence des brûlés dans le Nord-est de l'Iran.

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Méthodes. – Cette étude transversale a été réalisée sur des dossiers médicaux de tous les patients admis dans le département des brûlés et la chirurgie reconstructrice de l'hôpital Imam Reza, Mashhad, Iran depuis septembre 2014 jusqu'à août 2015. Les mesures de transfusion tels que Hb, Hct et les données démographiques ont été extraites des dossiers des patients. Le SPSS version 11.5 a été utilisé pour l'analyse des données.

Résultats. – Pendant la période d'étude, 701 patients brûlés ont été admis avec l'âge moyen de $25,5 \pm 20,5$ ans. Soixante-quatre pour cent étaient des hommes et le pourcentage de la totale de la surface corporelle brûlée (la SCT) été $30,9 \pm 24,2$ %. Environ un tiers (240) des patients ont reçu au moins un produit. La moyenne du concentré de globule rouge transfusé a été $274,1 \pm 674,6$ mL par patient et $8,85$ mL par 1 % de la SCT brûlée. L'anémie était le déclencheur de transfusion plus fréquent.

Conclusion. – La mortalité chez les patients brûlés qui ont reçu des produits sanguins était deux fois plus élevée chez les patients qui n'ont pas reçu des produits sanguins. Nous prescrivons moins de produits sanguins par rapport à d'autres centres des brûlés évalués, mais suite à un protocole écrit de transfusion sanguine par tous les cliniciens il peut réduire la transfusion sanguine dans les situations inutiles plus significativement. Il semble que d'autres recherches devraient être effectuées pour évaluer le déclencheur de transfusion dans d'autres unités de brûlure pour expliquer ces différences.

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Mots clés : Transfusion sanguine ; Brûlure ; Déclencheurs de transfusion ; Concentré de globule rouge

1. Introduction

Blood and its derivatives are one of the most lifesaving products in the modern medicine practice. Although blood and its derivatives are supplied free of charge by the Iranian Blood Transfusion Organization (IBTO) for all patients, it is expensive and annually requires substantial expenditure by the government. For example, the average cost of one unit of blood product in the USA is \$200 and a type and cross procedure cost is about \$150 [1]. Furthermore, blood transfusion is not an absolutely safe practice. Many adverse effects are attributable to blood transfusion, including infection, transfusion-related acute lung injury, immunosuppression, multi-organ dysfunction, acute respiratory syndrome, transfusion errors, transmission of infectious agents such as HIV, HBV, HCV and malaria and an increase in mortality [2–4].

In 2005, above 1.6 million units of blood were collected by IBTO and about 1.5 million units of red blood cell (RBC) were consumed [5]. In Iran, blood supplying system is based on voluntary blood donation and self-sufficiency in blood products. Their liberal use in addition to some complications, may cause the demand to surpass the supply. On the other hand, due to the decrement in the birth rate in recent decades in Iran, the average age of population is growing and transfusion requirement increases in the elderly population (> 65 years) as much as 20 times compared with population groups less than 41 years old [6]. Moreover, the phenomena of aging may end to reduction in voluntary blood donors, who are mostly 20–40 year old males [5].

Because of its cost, scarcity and potential side effects, any physician must make every possible effort to restrict blood transfusion to situations in which the benefits are apparently higher than the side effects. In this study, we investigated blood transfusion in a referral burn center to describe how and when blood products were prescribed.

2. Methods

The study was approved by the research council of Mashhad University of Medical Sciences. In this cross-sectional study,

medical records of all patients hospitalized in the Department of Burns and Reconstructive Surgery of Imam Reza hospital (the only burn center in Khorasan Razavi Province, Iran) were studied during a calendar year, from September 23, 2014. All patients with any mechanism of burn injury in any age category were included in the study. The data related to patients with acute burn were extracted from Hospital Information System. Burnt patients with major trauma who received blood products because of their trauma, were excluded from the study. For patients with repeated hospitalization, all data were gathered and all admission records of any patient were analyzed only once. Information related to indications of blood transfusion was extracted from transfusion data sheets.

Having considered that the mean of blood volume in children and adult patients is 80 mL/kg, we estimated blood volume by multiplying patient weight by 80.

In this study, the volume of each unit of packed red blood cell (pRBC) was considered 300 mL, and to estimate the mean percent of blood volume which has been substituted by pRBC, we divided the total blood volume of all patients by the total volume of all prescribed pRBC units.

SPSS version 11.5 was used for data analysis. The descriptive analysis is presented with frequency (percentage) and mean (standard deviation). Independent sample *t*-test and χ^2 test were used for inferential analysis. Binary logistic regression was used to find possible predictors of death. A $P < 0.05$ was considered statistically significant.

3. Results

During a year, 701 acute burnt patients were hospitalized in the burns department. The mean age of patients was 25.5 ± 20.5 years. No significant gender difference was found in different age groups. Of all patients, 453 (64.6%) were male. The mean of burnt percent of total body surface area (TBSA) was 30.9 ± 24.4 %. Burn percentage was significantly higher in females (34.0 ± 26.2 vs. 29.3 ± 23.1 , $P = 0.02$). Case fatality rate in acute burnt patients was 17.7% (124). The mean burnt TBSA in expired patients was 65.4 ± 27.6 %. About one third of patients (32.9%) were children less than 13 years old (Table 1).

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