

REVIEW

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Children are not little adults: blood transfusion in children with burn injury

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Abstract

Blood transfusion in burns larger than 20% total body surface area (TBSA) are frequent due to operative procedures, blood sampling, and physiologic response to burn injury. Optimizing the use of blood transfusions requires an understanding of the physiology of burn injury, the risks and benefits of blood transfusion, and the indications for transfusion. Age also plays a role in determining blood transfusion requirements. Children in particular have a different physiology than adults, which needs to be considered prior to transfusing blood and blood products. This article describes the physiologic differences between children and adults in general and after burn injury and describes how these differences impact blood transfusion practices in children.

Keywords: Blood transfusion, Pediatric, Burn injury

Background

Children and adults have different physiologic and hematologic systems, which impacts therapeutic interventions and their efficacy. In addition, children of different ages have different physiology and anatomy, which further complicates treatment. For example, an infant has a higher metabolic rate than an 8-year-old, a larger body surface area to mass ratio, and a markedly smaller blood volume. Hence, different strategies need to be employed when treating children of different ages. These differences are accentuated in burn injury, which further alters metabolism, anatomy, and physiology. Understanding the differences among children of different age groups is essential to optimize the use of blood transfusion in children. This article will discuss how differences in the physiologic, hematologic, metabolic, and immunologic systems in burned children impact blood transfusion requirements. Although this article describes how children differ from adults in terms of factors with impact on blood transfusion, the unique primary aim of this article is to understand how burned children are impacted by blood transfusion and describe optimal transfusion practices in burned children (Table 1).

Review

Children and adults have differences in hematologic and physiologic characteristics

Children clearly have a smaller stature than adults, yet their requirements may actually exceed those for adults on a kilo per kilo basis. For example, young children have a greater body surface area per mass than an adult, and the distribution of that mass is different than in adults. This impacts burn size determination, intravenous fluid requirements, and blood transfusion requirements.

Even the most essential body systems are impacted by the differences between children and adults. Heart rate measurement is simple, yet there are important differences between children and adults that should be considered when instituting burn treatment. The baseline heart rate in a child is higher than that in an adult and varies with age [1]. Burned children have a higher cardiac output and heart rate than unburned children, which can predispose them to heart failure.

Cardiac function also differs with age. As a baseline, a newborn child's myocardium is at near maximum function; hence, the newborn may not be able to compensate for decreased oxygen carrying capacity by increasing cardiac output after injury [2]. In other words, an infant increases heart rate rather than contractility to increase cardiac output. In the burned child, whose hypermetabolic rate adds further demand to an already stressed system, tachycardia is increased. Hence, burned infants

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