Editorial

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Necessity of Defining Different Transfusion Protocols for Different Kinds of Trauma Injuries

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The concept of shock needs to be re-evaluated, since sole emphasis on the reduction of intravascular volume and subsequent decreased tissue perfusion could not explain various conditions of trauma patients and is not applicable enough to help us to understand and manage the shock in different situations. Perhaps we need to add a new concept that refers to irreversible damage to the body organs. The concept of our concern is to keep trauma victims alive and reduce possibility of multiorgan failure. It is obvious that in any different state of shock, the most important goal is to maintain the integrity and function of the central nervous system and it needs to be dealt with differently in every particular situation. Presumably, a better definition of shock is defined as metabolic conditions which alongside intravascular effective volume changes, results in irreversible tissue damages. Therefore, the point is to define different ultimate goals for management, and thresholds for resuscitation and transfusion in different conditions.

Administration of blood and blood products is one of the main cornerstones in management of trauma patients and it has been always changing and developing [1]. These changes are due to advances in our understanding of the pathophysiology of trauma and shock, as well as invention and generation of new products and performing studies which have represented the results of different treatment strategies [2].

Based on ATLS course, the whole blood transfusions were replaced with blood component therapy and most of the transfusion was in operating room for trauma patients [3]. The ATLS course also recommends aggressive crystalloid fluid resuscitation to raise the blood pressure in post-traumatic patients [3]. Before all this progress in this field, administration of blood and blood products, was merely based on patients' vital signs; But nowadays, it is clearly known that there is a certain drop in blood pressure in trauma patients only when all compensatory mechanisms has failed. Furthermore, intravenous administration of crystalloids may temporarily increase the intravascular volume and blood pressure regarding Frank-Starling law, while there will be no increase in oxygen carrying capacity of (hemo) cardiovascular system. Besides, often high volume infusion increases the risk of coagulopathy

and pulmonary edema. Therefore, early transfusion in order to damage control management should always be born in mind [4,5]. With the discovery of new serum markers such as blood lactate and base deficit of arterial blood gas, it is now possible to identify patients at greater risk [4,6]. Also some studies have shown benefits of early transfusion in trauma patients [4].

Study of Spahn *et al*., [6] showed that there is no objective data describing the relationship between the risk of bleeding and the mechanism of injury in blunt trauma patients. The mechanism of injury can be determine whether the patient with hemorrhagic shock will be a candidate for surgical of bleeding control. Study recommends that these patients with the identified source of bleeding should undergo a procedure of immediate bleeding control unless initial resuscitation is successful. However, to date, there is no comprehensive protocol, including all clinical and laboratory findings, on which all experts agree [2]. Perhaps this controversy is because of different pathophysiology of various traumatic circumstances, such as presence of severe tissue injury, broken pelvis and femur, the amount and rate of blood loss and the presence of traumatic brain injury that has not been counted separately in studies. Management should be more aggressive because victims with multiple traumas particularly have different and harder to manage shock with less volume, loss comparing to those with penetrating trauma when long bone fractures are present. Also, when multiple traumas are associated with head injury borders to develop irreversible damages to CNS and coagulopathy is very limited clinically and metabolically.

We finally found that a single protocol could not be appropriate for management of all trauma patients with blood and blood products in our center, which is a level I Trauma Center and the main referral trauma center in southwest of Iran. This finding were based on the extensive studies and observations on trauma patients for whom resuscitation was performed according to ATLS protocols, as well as studies on laboratory animal models, and with full respect for ethical principles.

We have designed three different protocols for starting, monitoring and termination of blood products transfusion in different situations, according to physiological needs, tolerance of cardiovascular system with a focus on minimizing the amount of transfused products. Hereby, we aim to present these three protocols as (Figures 1, 2 and 3), so that they could be understood and referred to, much more easily.

Remember that in all patients, correction of

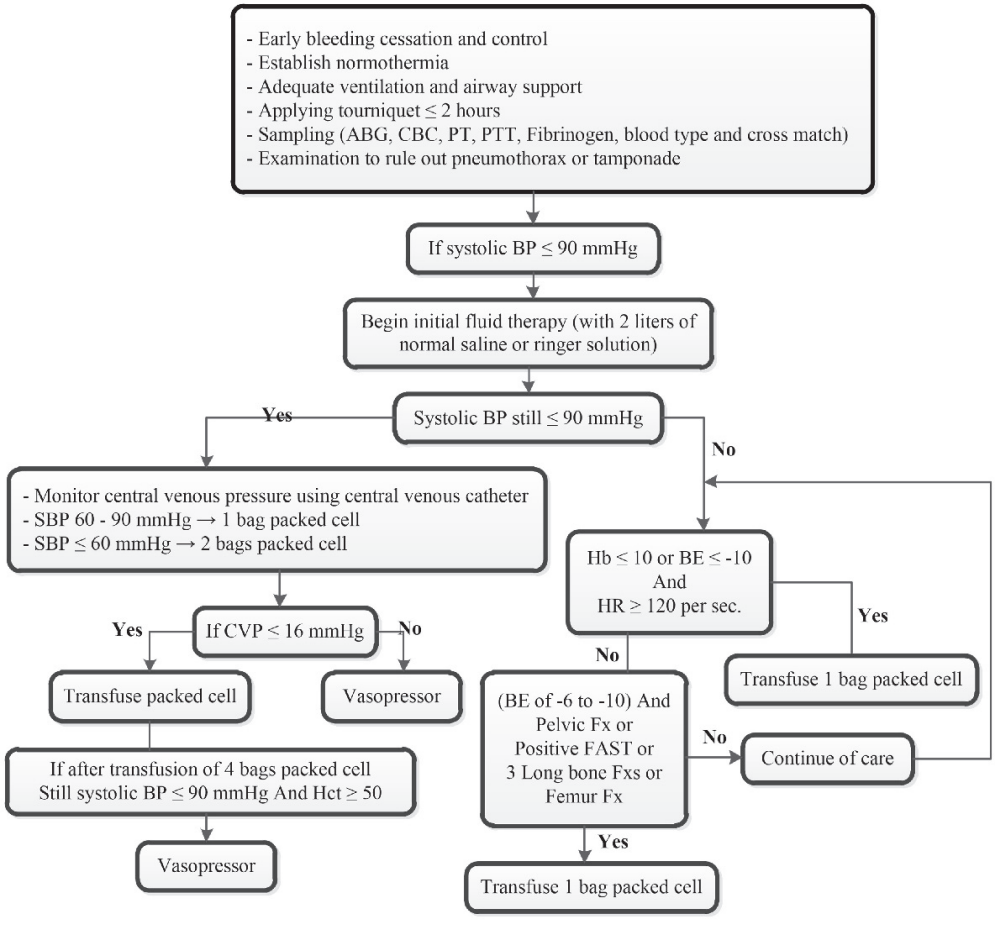

Fig. 1. Protocol of blood products transfusion in patients with multiple trauma without traumatic brain injury. ABG, arterial blood gas; BE, base excess; BP, blood pressure; CBC, complete blood count; CVP, central venous pressure; FAST, focused assessment with sonography in trauma; Fx, fracture; Hb, hemoglobin; Hct, hematocrit; HR, heart rate; PT, prothrombin time; PTT, partial thromboplastin time; SBP, systolic blood pressure.

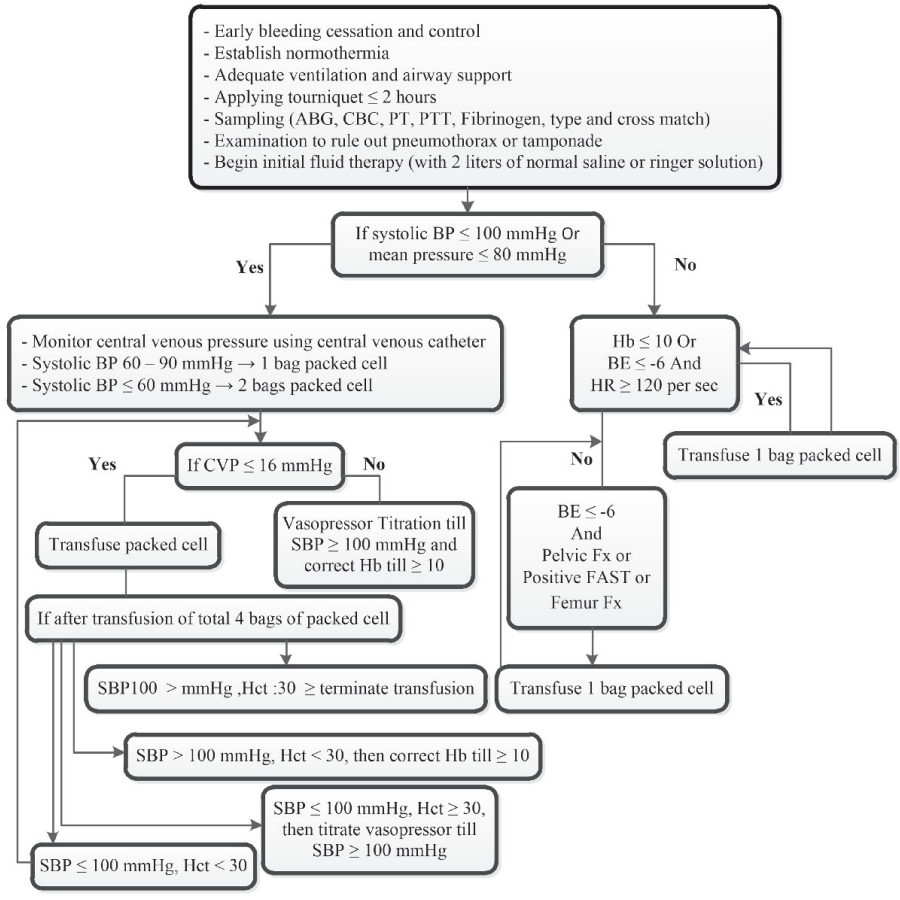

Fig. 2. Protocol of blood products transfusion in patients with multiple trauma with traumatic brain injury. ABG, arterial blood gas; BE, base excess; BP, blood pressure; CBC, complete blood count; CVP, central venous pressure; FAST, focused assessment with sonography in trauma; Fx, fracture; Hb, hemoglobin; Hct, hematocrit; HR, heart rate; PT, prothrombin time; PTT, partial thromboplastin time; SBP, systolic blood pressure.

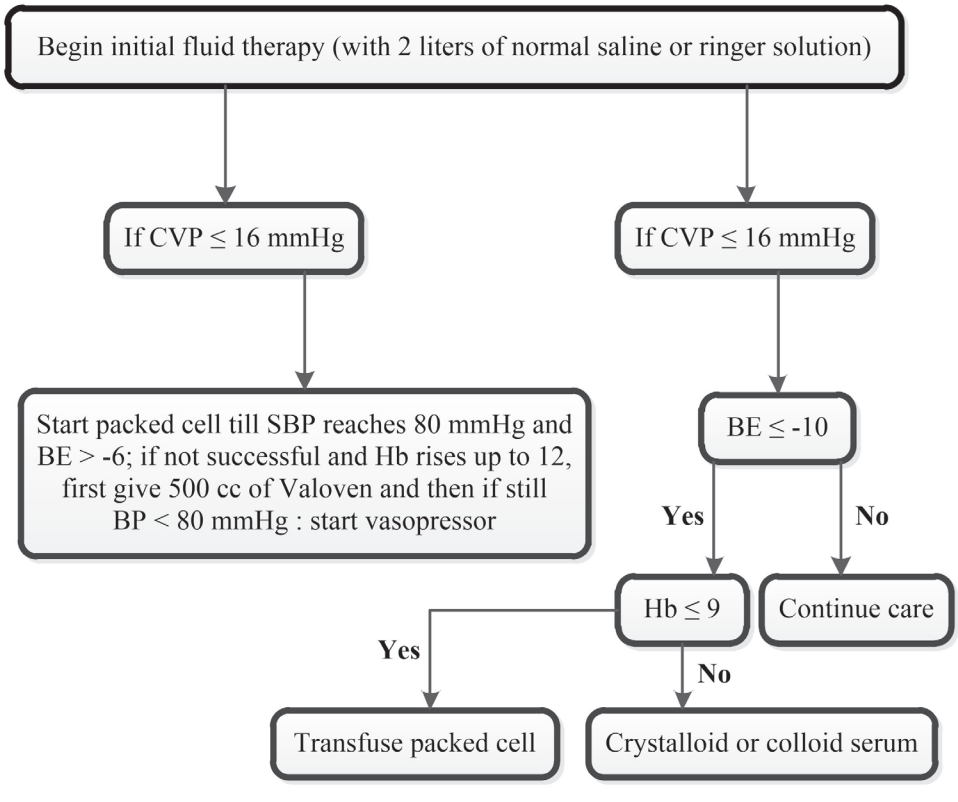

Fig. 3. Protocol of blood products transfusion in patients with penetrating trauma to trunk, extremities or neck, without traumatic brain injury. BE, base excess; BP, blood pressure; Hb, hemoglobin; SBP, systolic blood pressure.

coagulopathies must be dealt with simultaneously as follows. Note that this strategy allows to reduce exposure to blood products, and to improve patient outcomes [5].

- Transfuse fresh frozen plasma (FFP) at a 1:1.5 ratio with packed cell. However, some studies have shown the benefits of fixed ratio of blood, plasma and platelets [1]. On the other hand, some have proved wastage of plasma with these fixed protocols [7].
- Tranexamic acid: give 1 gram each 10 minutes, if it has been less than 3 hours since the trauma for victims with head injury and also trauma patients with severe injuries.
- Calcium: only if patients has received 6 bags or more of packed cell or ionized calcium is less than 0.9 mmol/liter
- Fibrinogen: give 1-2 grams if fibrinogen level is less than 1.5 g/L
- Platelet: if total count is less than 50.000
- Desmopressin: give 0.3 μg/kg, if patients use anticoagulative agents such as Aspirin or Plavix.
- Active factor VII (prothrombic complex concentration): in patients who use Warfarin and are bleeding.

Conflict of Interest: None declared.

References

1. Lal DS, Shaz BH. Massive transfusion: blood component ratios. *Curr Opin Hematol*. 2013;**20**(6):521-5.
2. Kwan I, Bunn F, Chinnock P, Roberts I. Timing and volume of fluid administration for patients with bleeding. *Cochrane Database Syst Rev*. 2014;3:CD002245.
3. Mattox KL. The ebb and flow of fluid (as in resuscitation). *Eur J Trauma Emerg Surg*. 2015;**41**(2):119-27.
4. Tapia NM, Suliburk J, Mattox KL. The initial trauma center fluid management of penetrating injury: a systematic review. *Clin Orthop Relat Res*. 2013;**471**(12):3961-73.
5. Goodnough LT, Spain DA, Maggio P. Logistics of transfusion support for patients with massive hemorrhage. *Curr Opin Anaesthesiol*. 2013;**26**(2):208-14.
6. Spahn DR, Bouillon B, Cerny V, Coats TJ, Duranteau J, Fernandez-Mondejar E, et al. Management of bleeding and coagulopathy following major trauma: an updated European guideline. *Crit Care*. 2013;**17**(2):R76.
7. Nascimento B, Callum J, Tien H, Rubenfeld G, Pinto R, Lin Y, et al. Effect of a fixed-ratio (1:1:1) transfusion protocol versus laboratory-results-guided transfusion in patients with severe trauma: a randomized feasibility trial. *CMAJ*. 2013;**185**(12):E583-9.