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INDICATIONS FOR MASSIVE TRANSFUSION IN THE CONDITION OF SEVERE TRAUMA: A LITERATURE REVIEW

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Abstract: Goal: Dissertation about the effective indications for massive transfusion in patients with severe trauma. **Method**: Literature review prepared between October and November 2022, through a search in the Scielo and Pubmed databases with the descriptors "massive transfusion", "blood Component transfusion", "protocol" and "indications". 5353 articles were found and, after the inclusion and exclusion criteria, 13 studies were selected. **Review**: Hemorrhage is a preeminent cause of possibly preventable mortality in cases of trauma and in many cases requires massive transfusions (MT). Thus, in clinical practice it is mainly based on guidelines that determine different TM protocols (MTP). After the appreciation of an abundance of clinical parameters of the patient, one can opt for the massive transfusion that must be performed in a period of 24 hours. **Conclusion:** The lack of research that standardizes parameters for massive transfusions leads teams to evaluate different clinical standards based on different emergency services.
Keywords: Massive transfusion; Transfusion of blood components; Protocol and Indications.

INTRODUCTION

Polytraumatized patients commonly present hemorrhages of different intensities, and when severe, they have a high mortality and morbidity rate, which results in interventions for volume replacement, such as management through massive transfusion (MT). This procedure is characterized by replacing the blood volume with different blood products, including plasma, platelets and red blood cells, in order to prevent the patient from entering a possible hemorrhagic shock resulting from hypovolemia. Studies on the effective indications and protocols for the use of such a procedure are scarce and the

information is still relatively questionable, but new research has shown evidence of a significant decrease in the mortality and morbidity rates when massive transfusion is performed within three to four hours of the procedure. onset of bleeding (SANDERSON B. E et al., 2020; CONSUNJI, R. et al., 2020).

The ABC Score protocol has a strong role, since it is widely used by reference services in trauma care, and uses research tools such as the Focused Assessment with Sonography for Trauma (FAST), which investigates areas of greater probability of hemorrhage after trauma. The TASH Score (Trauma Associated Severe Hemorrhage) scoring system is part of the important tools to indicate massive transfusion in conditions of significant bleeding (ABUZEID A.M.; O'KEEFFE, T., 2019).

Due to the significant differences and diversity of protocols, which can complement each other in trauma assessment, the analysis and possible evaluation of such tools can provide greater efficiency and optimization in the initial management of traumatic and hemorrhagic conditions. Given this context, the study aims to discuss the effective indications and different parameters considered for massive transfusion in patients with severe trauma, also discussing the prevalence of coagulopathy as one of the risk factors associated with it.

METHODOLOGY

This is a bibliographic review developed according to the criteria of the PVO strategy, an acronym that represents: population or research problem, variables and outcome. Used for the development of the research through its guiding question: "What are the effective indications and different parameters for performing massive transfusion, taking into account the prevalence of coagulopathy associated with it?". In this sense, according to the parameters mentioned above, the population of this research refers to patients who were victims of severe trauma who underwent massive transfusion, taking into account the coagulopathy conditions common to the procedure and its prognosis. The searches were carried out through searches in the PubMed database. The descriptors were used in combination with the Boolean term "AND" and "OR": Massive Transfusion; Blood Component Transfusion; Protocol; Indications, through the following string: ((massive transfusion) OR (Blood Component Transfusion) AND (protocol) OR (indications). meta-analysis made available in full. The exclusion criteria were: duplicate articles, made available in summary form, which did not directly address the studied proposal and which did not meet the other inclusion criteria. After associating the descriptors used in the searched databases, they were found a total of 3114 articles. After applying the inclusion and exclusion criteria, 13 articles were selected to compose the collection of this study. all.

REVIEW

The management of patients with major bleeding usually requires the urgent administration of multiple blood components, a procedure commonly called massive transfusion (MT) (SANDERSON B. et al., 2020). Hemorrhage is the leading cause of potentially preventable mortality in trauma patients. Early intervention in the first 24 hours after the event is essential in terms of survival, with the intention of reducing complications and controlling hypoperfusion conditions (ESTEBARANZ-SANTAMARÍA C. et al., 2018; SHIH A.W. et al., 2019; MENESES E. et al., 2020).

The massive transfusion protocol (MTP), in general terms, consists of transfusing >10 packed red blood cells in the first 24 hours

or >4 packed red blood cells in the first hour in patients with bleeding conditions (EL-MENYAR A. et al., 2019). In patients who are victims of major trauma, in addition to MTP, replacement of platelets and coagulation factors is recommended to establish good hemostasis. However, not all patients with severe trauma will be submitted to this strategy, so that predicting the real need for TM is considered essential, and can only be performed after evaluating a series of clinical, analytical and anatomical parameters, which are described as predictors or "triggers" (ESTEBARANZ-SANTAMARÍA C. et al., 2018).

Triggers of MTP activation include persistent hemodynamic instability, active bleeding that requires surgical or radiological intervention, need for immediate blood transfusion in the area of trauma. The use of a scoring system whose parameters include the trauma mechanism, in addition to vital parameters, including a reduction in systolic blood pressure (SBP) <90 mmHg, an increase in heart rate (HR) >120 beats per minute, associated with a positive result for liquids on ultrasound according to the FAST assessment (EL-MENYAR A. et al., 2019). Such parameters are used, the Traumatic Bleeding Severity Score and the ABC Score, in addition to including pulse oximetry and some laboratory values in the evaluation (PARIMI N. et al., 2018; MENESES E. et al., 2020).

The main benefits are maintaining perfusion, organ oxygenation, homeostasis, facilitating communication between teams, thus avoiding delays in caring for polytraumatized patients. However, inappropriate use of MTP can contribute to inappropriate administration and cause safety risks to the transfusion process (SHIH A.W. et a., 2019). Clinical practice in this setting is supported in part by evidence-based MT guidelines, who normally recommend a good understanding of the transfusion process by the responsible team (SANDERSON B. et al., 2020).

Gradually, in recent decades, new strategies and protocols have been created with the aim of avoiding the so-called "lethal triad", which includes changes in metabolic acidosis, hypothermia and coagulopathy (ESTEBARANZ-SANTAMARÍA C. et al., 2018). Some studies indicate a ratio of 1:1:1 and 1:1:2 for plasma, platelets and red blood cells and that a shorter period of time in the transfusion process presents better prognoses. Fibrinogen influences the results, and when reduced, it alters platelet aggregation in cases of hemorrhage, which disrupts the coagulation processes (MENESES E. et al., 2020).

According to Estebaranz-Santamaría C. et al. (2018), it was concluded that the time of 10-15 minutes from the arrival of the patient to the reference service, the vital parameters together with the hemoglobin values is considered as a positive trigger for hemorrhagic severity when their values are less than 11 g /dl, while the international normalized ratio (INR) has a high predictive value when ≥1.5 (ESTEBARANZ-SANTAMARÍA C. et al., 2018). MTP proved to be sensitive and reliable in predicting the need for MT at 6 h, as well as at 24 h with increasing number of positive triggers (EL-MENYAR A. et al., 2019). Patients who require more than three units of blood in one hour (or anticipated), patients with loss greater than 50% of blood volume in three hours, or patients classified in grade IV shock (VAN TURENHOUT E. C. et al., 2020).

Frozen plasma can also be used in patients with active bleeding and with an INR greater than 1.6, in order to reduce the anticoagulant effects. In patients with thrombocytopenia or platelet dysfunction, platelet transfusion is

indicated to prevent bleeding (SHARMA S. et al., 2011). Furthermore, after taking into account clinical judgment, complemented by tools and predictive scores in the decision to start MTP in order to replace the ongoing blood loss, the patient must receive 2 liters of crystalloid solution. However, this action is associated with adverse effects, including dilutional coagulopathy, acidosis, hypothermia and accelerated blood loss (VAN TURENHOUT E. C. et al., 2020), with crystalloid being associated with increased morbidity and mortality (LAL D.; SHAZ B., 2013).

Next, it is necessary to notify the laboratory regarding the beginning and end of the protocol. In addition, coagulogram tests, including prothrombin activity time (PTT), activated partial thromboplastin time (APTT), fibrinogen, along with complete blood count, arterial blood gas analysis and blood typing test, must be collected for the purpose of avoid adverse reactions. After the collection, it is important to prepare and supply the blood components, with the transfusion of positive blood. Therefore, it is recommended to use the ratio of concentrated red blood cells, platelets, fresh frozen plasma of 1:1:1 (VAN TURENHOUT E. C. et al., 2020).

According to a study by Lal D and Shaz B. (2013), the MTP protocol based on a 3:2 ratio of red blood cells to plasma and a 5:1 ratio of red blood cells to platelets, have better survival in patients polytrauma patients, in addition to reducing the rates of organ failure and post-traumatic complications. While red blood cells provide benefits in volume expansion as they benefit homeostasis, reducing the risk of thrombosis by restoring oxygen transport capacity, in addition to acting by reducing mixed acidosis through tissue hypoxia (VAN TURENHOUT E. C. et al., 2020).

Among the main complications of the MTP procedure, metabolic alkalosis and hypokalemia, due to the citrate present in the transfused blood bags, stand out. Furthermore, the decrease in calcium can cause paresthesias and/or cardiac arrhythmias, and intravenous administration of calcium gluconate is recommended. Because they are stored at temperatures of 1-6°C, blood bags may experience hypothermia if no blood warmer is being used. Furthermore, when administered in large volumes, these factors contribute to the "lethal triad" of coagulopathy, acidosis, and hypothermia, which is associated with poor survival. Thus, early administration of plasma and platelets is recommended because 10-25% of these patients are admitted with trauma-induced early coagulopathy (ITPC) (LAL D.; SHAZ B., 2013).

According to Li D. et al. (2021), massive transfusion protocol in elderly patients, would have the potential to improve platelet parameters, decreasing clotting time, avoiding coagulopathy. In these cases, the blood products used in this protocol are indicated to reduce the risk of serious complications. These patients may present an improvement in their clinical condition with the massive transfusion protocol. However, they may have complications after the procedure, one of which is organ failure.

Despite this, even in the absence of preponderant risk factors, there are several complications related to blood transfusion. Transfusion-related infections are less common than non-infectious complications. All non-infectious transfusion complications are classified as serious non-infectious transfusion risks. Acute complications occur within minutes to 24 hours after transfusion, while late complications can develop days, months, or even years later. Most of these complications are focused on coagulopathies,

such as hemolytic transfusion reactions, intra and extravascular hemolysis, among others (SHARMA S. et al., 2011).

Patients with multiple traumatic injuries constantly present severe metabolic dysfunction with the release of cytokines, inflammatory factors and stress hormones as an action to regulate and compensate for recurrent losses due to trauma, and according to Shand S et al. (2019), the massive blood transfusion protocol has the main objective of providing hemostasis through blood with blood products and synthetic agents.

However, it is up to the doctor and the care unit to decide whether to perform such a procedure, seeking to restore volume, homeostasis and oxygen transport, or the application of other possible therapeutic approaches (MENESES E. et al., 2020).

FINAL CONSIDERATIONS

TM is part of strategies for hemorrhagic control in severe trauma and seeks to ensure quick access to blood products by the medical team and patients. Several studies have been carried out regarding the effective indications for the use of this procedure, also seeking to explain coagulopathies as a risk factor associated with transfused patients. However, research that standardizes the parameters for performing transfusions is still scarce, causing teams to assess divergent clinical patterns depending on the emergency service which can delay patient submission to transfusion and increase their exposure to coagulopathies. Therefore, it is necessary to intensify studies and discussions regarding the existing protocols for massive transfusions, considering the experiences of different health services and the norms used in each one, making it possible to unify parameters, allowing efficiency and optimization in the initial management of traumatic conditions.

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