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RESEARCH ARTICLE

MASSIVE FLUID RESUSCITATION IN A TRAUMA VICTIM: A LIFE-SAVING TREATMENT IN A UNIVERSITY HOSPITAL CLINIC

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ABSTRACT

Fluid therapy is an integral aspect of trauma resuscitation.With advances in resuscitation research, controversies abound regarding approaches to the fluid management.To determine therapeutic strategies, patients response to the initial fluid challenge is very important. In this case, we discuss the life saving massive fluid resuscitation in hemorrhaging patient who had been operated three times and stayed in the ICU for days because of a knife injury resulting from a stab wound in the chest, abdomen and right shoulder.

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INTRODUCTION

Injuries are estimated to become the number one cause of death for men and women under the age of 45 by the year 2020 (Chaison, 2001). Uncontrolled bleeding is the reason of the 30-40 % of early. mortalities (1). Trauma patients present unique challenges to anaesthesiologists Acute injuries require resorce intensive care and are often complex cases, especially when coupled with underlying preexisting medical conditions. As a result of trauma, hemorrhage is a medical emergency. Significant loss of intravascular volume may lead sequentially to hemodynamic instability, decreased tissue perfusion, cellular hypoxia, organ damage, and death. Life-threatening decreases in blood pressure often are associated with a state of shock – a condition in which tissue perfusion is not capable of sustaining aerobic metabolism. Shock can be produced by decreases in cardiac output (cardiogenic), by sepsis (distributive), or by decreases in intravascular volume (hypovolemic). Class I is a nonshock state, such as occurs when donating a unit of blood, whereas class IV is a preterminal event requiring immediate therapy (Bold, 2008). Massive hemorrhage may be defined as loss of total EBV within a 24-hour period, or loss of half of the EBV in a 3-hour period (2,3).

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Fluid therapy is an integral aspect of trauma resuscitation. Advanced Trauma Life Support (ATLS) guidelines recommend an initial rapid infusion of fluid in trauma and hemorrhage victims as a diagnostic procedure to aid treatment decisions. In this case, we discuss the agressive fluid resuscitation in hemorrhaging patient who had been operated three times and stayed in the ICU for days.

Report of a case

We report a case of ASA1E 80 kg. young male who was hospitalized because of a knife injury resulting from a stab wound in the chest, abdomen and right shoulder. On admission, Glasgow Coma scale was 15, and his vital signs were documented as arterial blood pressure (BP) 72/40, heart rate (HR) 153 beats per minute. His chest X-ray revealed hemopneumotorax, and a chest tube was inserted. When the patient became hemodynamically unstable, an arterial cannula and a large-bore central venous cathater were placed. Then, 0.9 % crystalloid and colloid (Gelofusine) infusion were started. The drainage was estimated to be 900 mL from the chest tube at that time. Despite massive infusion of fluids, hemodynamic stability could notbe maintained. Therefore, the patient was taken immediately to the operating room (OR) to undergo surgical exploration. Anaesthetic induction was done with ketamine HCL (2.5 mg/kg, i.v.), midazolam (0.05 mg/kg, i.v.) and rocuronium bromide (0.6 mg/kg, i.v).

Classification of hemorrhage

	Class			
Parameter	I	II	III	IV
Blood loss (ml)	<750	750–1500	1500–2000	>2000
Blood loss (%)	<15%	15–30%	30–40%	>40%
Pulse rate (beats/min)	<100	>100	>120	>140
Blood pressure	Normal	Decreased	Decreased	Decreased
Respiratory rate (breaths/min)	14–20	20–30	30–40	>35
Urine output (ml/hour)	>30	20–30	5–15	Negligible
CNS symptoms	Normal	Anxious	Confused	Lethargic

In addition to fluid, vasopressin (10 mcg/kg/min) was started as well. A right thoracotomy was performed. At operation, a right atrial tear measuring 1 cm. lenght was noted and was repaired with cardiorrhaphy. The operation longed for 130 minutes. During the operation vital signs were as following; HR, between 176-118, arterial BP 90-74/53-48.Total blood loss during the surgery was 4200 mL. 4000 mL Ringer's lactate (RL) solution, 2000 mL colloid, 8 Uerythrocytesuspansion (ES) and 3 U fresh frosen plasma (FFP) were given in total, during the operation. Total urine output was 400mlduring the operation. Postoperatively, the patient was transferred to the Intensive care unit (ICU) as intubated. He was mechanically ventilated as the mode sımv-pc fio2:0.6, VT:7mlkg, F:12, PEEP:5 Electrolyte imbalance was corrected with consecutive blood gas analysis (Table 1 and 2). In ICU, further 4000 mL RL, 3000 mL colloids, 9 U ES, 4 U FFP and 6 U platelet solution (PS) were replaced. Because of the sudden bleeding aproximately 900 ml. in the chest tube, re-thoracotomy was planned immediately. The patient was taken to the OR, and underwent an emergent pericardial exploration, and pericardial tamponade was evacuated. The surgery lasted about 120 minutes, this time. Estimated blood loss was 3000 ml. A total of 6000 mL RL, 3000 mL colloids, 6U ES, 4 U FFP and 6U PS were replaced again, and hemodynamic stability was then achieved. He was re-transferred to the ICU, postoperatively, with vital signs of HR 108/min, arterial BP 114/56 mmHg, sO2 98 %.

In ICU, further 6 UES, 4 U FFP and 6 U PS were replaced until the control of hemoglobine levels. However, in several hours, the patient again presented with signs of shock. After an immediate consultation, a third operation was planned. After sternotomy, pericardial hematoma was explored. Ventricular repair and cardiorraphy procedures were performed. During this third operation, 4 U ES, 4 U FFP and 12 U PS were replaced. The patient was transferred again to the ICU intubated. In ICU, the patient was hemodynamically stable. Twenty hours later, he was alert, spontaneous breathing was adequate, weaning planned he was extubated. Then, he was taken to the ward. He was discharged from the hospital 9 days after the surgery. His general condition and biochemical results were all normal on discharge. In total, from admission to the discharge, 26000 mL cristalloid, 14000ml colloid, 33 U ES, 18 FFP, 30 PS were replaced and patient was kept alive after an enormous effort of all anaesthesiology team.

DISCUSSION

Fluid resuscitation with colloid and crystalloid solutions is a ubiquitous intervention in acute medicine. The selection and the use of resuscitation fluids is based on physiological principles. But clinical practise is determined largely by clinician preference. Today, asanguinous fluids are used in almost all patients undergoing general anaesthesia for majörsurgery, in patients with severe trauma and burns, and in patients in the ICU.

Fluid resuscitation can effectively decrease additional blood loss, minimize hemodilution and coagulopathy, improve early survival rate and reduce apoptosisofvisceral organs with severe and uncontrolled hemorrhagic shock (4). In this case, the life saving role of fluid resuscitation in the treatment of severe and uncontrolled hemorrhagic shock is shown. In Class III and Class IV hemorrhages, crystalloids and colloids are used. In this case, before surgery, total blood loss was over 30 % of his blood volume (5). For this reason, we planned to use crystalloids, colloids and blood products for resuscitation. Crystalloids are water solutions of inorganic ions and small organic molecules. They have increased volume of distribution that encompasses the entire interstitial and intercellular compartment. Owing to capillary permeability, they have limited half life because they easily escape from the intravascular space into the tissues. When crstalloids are infused, about 75% extravasate into the interstitial space while only 25% remain in the intravascular space (6,7). Colloids are heterogeneous resuscitation fluids with increased molecular size and weight. They are often referred to as volume expanders because of their inherent characteristic variable molecular size and water retaining capability. Joachim Boldt and his friends stated in a prospective review of 111 consecutive patients who died in hospital after admission for treatment of injuries, the most common defects in patients management were related to inadequate fluid resuscitation (2,3). Adequate volume therapy appears to be a cornerstone of managing the trauma patients. The primary goal of volume administration is to guarantee stable systemic hemodynamics and microcirculation by rapidly restoring circulating plasma volume. Blood or blood products should be avoided as far as possible due to the unwanted risks. There is good evidence that suggests even for very short periods of time rapid infusion of colloid is given very rapidly. This is particularly important in aclinical scenario in which hypotension is immediately life threatening. Recent studies suggest that intraoperative fluid resuscitation with predominantly colloids appears to improve the quality of postoperative recovery compared with crstalloids. Here we used gelatins as colloids. Gelatins are polypeptides with a relatively small average molecular weight. They are a degration products of animal collagen and therefore inexpensive and readily available. Gelatins are appropriate as the fluid of first choice in volume resuscitation.

The use of blood and blood products is necessary when the estimated blood loss from hemorrhage exceeds 30% of the blood volume (Class III Hemorrhage). Presently a hypotensive patient who fails to respond to crstalloid in the face of probable hemorrhage should be treated with blood and blood products (8). Hemorrhagic shock from blood loss is a critical cause of mortality in severely injured patients. Contributing to blood

loss is an intrinsic dysregulation of blood coagulation system now named trauma induced coagulapathy (TIC). There is a rapidly growing body of support for a prominent role of platelet dysfunction in the pathophysiology of TIC. Moderate or even mildly decreased platelet agregation is strongly associated with mortality. Kuntcher et al used impedance aggregometry to characterize platelet dysfunction in trauma patients on arrival at the emergency department (9). In addition, specific effects of blood dilution from resuscitation fluids, enviromental hypothermia and asidosis can modulate clot formation adding more layers of complexity to TIC. In conclusion, fluid therapy is an integral aspect of trauma resuscitation. However, the appropriate rate of infusion and the choice of fluid have not been clearly defined.

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