Pharmacogn J. 2024; 16(6): 1436-1438
A Multifaceted Journal in the field of Natural Products and Pharmacognosy
www.phcogj.com

Case Report

A Successful Practice of Massive Transfusion in Traumatic Amputation of Digit I-V Manus Dextra: A Case Report

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ABSTRACT

Introduction: Massive blood is the main cause of mortality and morbidity in trauma patients, in which 6 out of 10 cases are reported to die. **Case presentation:** A 29-year-old man appears to have experienced an amputation of digit I-V manus dextra. Vital signs are in stable condition and the patient is also conscious (GCS of 15) with ASA PS 1. The patient underwent debridement and replantation for 18 hours. Post-first surgery, we found blood seepage in the surgical wound, which for 4 hours showed 2000 mL of blood. The patient experiences decreased consciousness (GCS of 9), hypotension (77/40 mmHg), HR of 130 ×/min, and cold extremities. The patient received resuscitation with 1000 mL of crystalloid, 500 mL of colloid, 800 mL of WB, and 400 mL of PRC transfusion. Abnormal laboratory examination revealed Hb 4.6 g/dL, albumin 1.4 g/dL, and prolongation of hemostasis function 2 times. The patient underwent re-operation and was found to have ruptured muscles and veins for which musculorraphy and venorraphy were performed for 16 hours. On the 3rd day, the patient experienced breathing difficulties (RR of 30 ×/min and SO_2 of 95%) and the chest x-ray showed lung edema. The patient was placed on a ventilator using NIV and furosemide 20 mg/8 h. The patient regained consciousness on the 7th day. **Discussion:** The principle of managing massive bleeding is to stop the bleeding, restore blood circulation volume, and maintain peripheral vascularization. **Conclusion:** Massive transfusion is a management strategy for preventing death due to hemorrhagic shock.

Keywords: Bleeding, Blood massive protocol, Hemorrhagic shock, Trauma.

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History

- Submission Date: 25-09-2024;
- Review completed: 22-10-2024;
- Accepted Date: 01-11-2024.

DOI : 10.5530/pj.2024.16.231

Article Available online

http://www.phcogj.com/v16/i6

INTRODUCTION

Massive bleeding is a significant cause of mortality and morbidity in a variety of clinical settings, both in trauma and non-trauma patients. However, most research has been focused on the trauma population. Half of all deaths in hospitals within the first 24 hours after severe injury are due to bleeding, which is potentially preventable. In the trauma setting itself, as many as six out of every ten deaths occurring within the first 3 hours of injury are caused by massive bleeding [1,2]. The management of massif bleeding is done through massive transfusion, which have been designed for timely recognition and efficient management to expedite the release of blood products for successful outcomes following significant blood loss [3,4]. Massive transfusion aims to limit complications and mitigate critical hypoperfusion while achieving hemostasis [5]. The study aimed to describe a successful massive transfusion in an Indonesian man with traumatic amputation of digit I-V manus dextra. The report was based on a Surgical Case Report (SCARE) 2023 guidelines [6].

Presentation of Case

A 29-year-old man complained of his entire right-hand fingers being severed after being hit by a chainsaw. The patient and family had no medical history of (diabetes mellitus, hypertension, or allergies). Physical examination revealed a clear airway, respiratory rate (RR) of 22 ×/min, and vesicular breath sounds were heard bilaterally in the lungs. On circulation examination, warm extremities were noted, with a pulse rate of 104 ×/min and blood pressure (BP) of 130/82 mmHg. The patient was conscious with a Glasgow coma scale (GCS) of 15, and no seizures or vomiting were found. Laboratory examinations and chest x-ray results were normal limits. The patient was diagnosed with traumatic amputation of digit I-V manus dextra according to x-ray result on the upper extremity dextra (Figure 1).

The patient is planned for debridement and replantation, and his physical status based on the American Society of Anesthesiologists (ASA) classification showed stage 1 without complications. After obtaining surgical and anesthesia consent, we performed the general anesthesia technique of sleep apnea intubation using a Macintosh laryngoscope blade no. 3 with endotracheal tube no. 7.5 and a lip margin of 20 cm. Bilateral lung fields had symmetric breath sounds. Intubation was carried out using fentanyl 100 mcg, propofol 80 mg, and rocuronium 50, followed by sevoflurane 2 Vol%, oxygen, and water as maintenance. Intraoperative hemodynamics were stable, with no periods of shock during the 18-hour surgery. Fluid balance during surgery involves Fluid input (crystalloid 2000 mL, colloid 2000 mL, and whole blood/WB 2800 mL) and fluid output (urine 900 mL and blood 4600 mL).

Post-surgery, the patient was observed in the intensive care unit (ICU), but blood leakage was found in the surgical wound. The bleeding went approximately 2000 mL in 4 hours. The patient's blood pressure dropped to 77/40 mmHg, heart rate rose to 130 ×/min, extremities felt cold, and somnolence (GCS of 9). The patient received resuscitation with 1000 mL of crystalloid, 500 mL of colloid, 800 mL of WB, and

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Figure 1. Right upper extremity x-ray showed traumatic amputation of digit 1-5 manus dextra at pre and post-surgery.

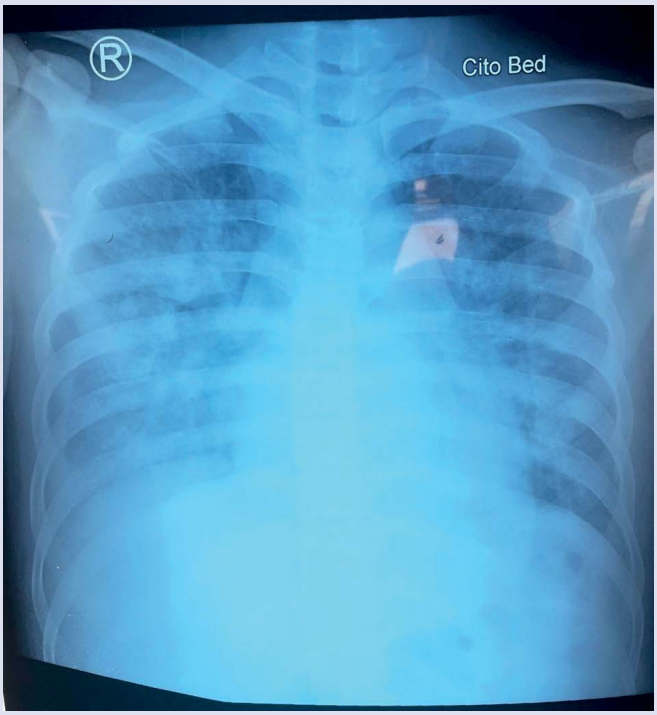

Figure 2. Chest x-ray showed edema in both lungs on the 3rd day post-surgery.

400 mL of packed red cell (PCR) transfusion. Laboratory examination revealed abnormal biomarkers, including hemoglobin (Hb) 4.6 g/dL, albumin 1.4 g/dL, and prolongation of hemostasis function 2 times (Table 1). The surgery team directly decided to carry the patient to the operation room for the second surgery. On the second surgery, muscle and vein ruptures were found and musculorphy and venorraphy were performed for 16 hours. During the second surgery, the fluid balance showed input of crystalloid 1500 mL, colloid 500 mL, WB 1200 mL, PRC 800 mL, Fresh Frozen Plasma (FFP) 350 mL, and Thrombocyte Concentrate (TC) 280 mL. The hemodynamic condition improved during the surgery.

On the 2nd day, the patient was placed on ventilator support in spontaneous mode, with a Ps of 5, PEEP of 5, and Fio2 of 30%, achieving sufficient tidal volume and minute volume with oxygen saturation (SO_2) of 99-100%. There was no increase in work breathing, hemodynamics were stable, post-operative laboratory results were good, and the patient was extubated. On the 3rd day, the patient complained of chest tightness. On physical examination, increased RRs were found up to 30×/min, with SO_2 of 95% using a simple mask of 10 L/min. Upon lung examination, rhonchi breath sounds were heard. On supporting chest x-ray, examination showed suspicion of lung edema (Figure 2). The patient was then assisted with breathing using a non-invasive ventilator (NIV) mask and was administered 20 mg/8 h furosemide.

The patient gradually improved during days 4-6 of treatment, with a fluid deficit of approximately 1000 mL/day. The patient started using a simple mask until the nasal cannula returned and achieved SO_2 of 99%. The patient's hemodynamic condition was stable and fully conscious on the 7th day of treatment.

DISCUSSION

Major bleeding is the condition of losing more than one blood volume in 24 hours or losing 50% of the total blood volume in less than 3 hours, or bleeding at a rate >150 mL/min [3]. The body responds to acute blood loss with four basic compensatory mechanisms, such as increasing cardiac output as the first response. This increase in cardiac output results in enhanced blood supply to vital organs or organs with a higher oxygen extraction ratio, which is the primary mechanism for the heart's compensation for anemia. Furthermore, the oxygen-hemoglobin dissociation curve adjusts during the anemic period. Then, during blood loss, the adrenergic nervous system is stimulated, leading to vasoconstriction and tachycardia [7]. Hemorrhagic shock contributes to 30-40% of trauma-related deaths [8,9].

The massive transfusion protocol is activated by clinicians in response to massive bleeding. Generally, this is activated after a transfusion of 4-10 units of PRBCs [10]. Several retrospective studies have shown the benefit of a higher plasma and platelet-to-red blood cell ratio. In prospective cohort studies, a higher plasma and platelet to red blood cell ratio has been associated with decreased mortality [11]. From existing observational studies, it appears that the optimal transfusion ratio is between 1:1 and 1:2 plasma to RBCs [12]. In European guidelines, a ratio of at least 1:2 plasma to RBCs, or fibrinogen concentrate and RBCs according to hemoglobin levels, is recommended [8,13].

The optimal approach to managing suspected bleeding patients is hemostatic resuscitation with prioritizing of damage control resuscitation and massive transfusion [14,15]. In addition, localizing and controlling the source of bleeding is crucial for the treatment of hemorrhagic shock. The source of bleeding in hemorrhagic shock may sometimes be visible or obscure. The primary goals of early resuscitation for hemorrhagic shock are to arrest ongoing bleeding, restore effective circulating blood volume, and restore tissue

perfusion [16]. With a broader understanding of the pathophysiology of hemorrhagic shock, trauma treatment has evolved from simple massive transfusion methods to more comprehensive management strategies like "Damage Control Resuscitation (DCR)". The concept of damage control resuscitation focuses on permissive hypotension, hemostatic resuscitation, and hemorrhage control to adequately treat the "lethal triad" of coagulopathy, acidosis, and hypothermia that occurs in trauma [17]. The potential for complications associated with massive blood transfusions is significantly high. Studies indicate that blood transfusions of more than 10 to 20 units do not enhance patient survival and are linked to a higher incidence of adverse events [18].

CONCLUSION

Massive bleeding remains a major problem and a leading cause of preventable deaths. management of massive bleeding includes stopping the bleeding, restoring the blood volume circulating, and maintain the peripheral perfusion. Thus, massive transfusion is crucial for preventing deaths due to hemorrhagic shock, which can be quite high.

CONFLICTS OF INTEREST

Kashi Ameta Resijiadi Juwono, Maulydia, and Prananda Surya Airlangga declare they have no conflict of interest.

FUNDING

Nothing.

ETHICAL APPROVAL

Ethical approval is exempt/waived at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia because the report only has one patient.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

AUTHOR CONTRIBUTION

Kashi Ameta Resijiadi Juwono: Data curation, investigation, visualization, resource, roles/writing - original draft; Maulydia: Conceptualization, methodology, formal analysis, validation, writing - review & editing; Prananda Surya Airlangga: supervision, writing - review & editing.

REGISTRATION FOR RESEARCH STUDIES

Not applicable.

GUARANTOR

Maulydia is the person in charge of the publication of our manuscript.

ACKNOWLEDGEMENTS

We would like to thank "Fis Citra Ariyanto", our editor.

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