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Case Report

Massive Blood Transfusion during Revision Total Hip Arthroplasty under Combined Spinal Epidural Anaesthesia

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Abstract

Revision total hip arthroplasty (THA) is an orthopaedic surgery that is known to be associated with excessive bleeding. The rates of mortality and morbidity are high in patients with massive haemorrhage. The patient in this study was administered blood products with high fresh frozen plasma/red blood cell (RBC) suspension ratio and high platelet/RBC suspension ratio without waiting for haemostasis test results. This study suggests that this approach might prove beneficial in reducing the incidence of intra- and postoperative complications. this study presents our experience with a patient who underwent THA and required a transfusion that was three times her estimated total blood volume. The patient was successfully managed with close monitoring of haemorrhage and timely administration of blood and blood products before hypotension and loss of consciousness occurred.

Keywords: Total hip arthroplasty, massive haemorrhage, massive transfusion, fresh frozen plasma, platelet suspension

Introduction

Revision total hip arthroplasty (THA) is a procedure in orthopaedics that is associated with excessive bleeding. The disruption of anatomical and physiological tissue integrity in revision THA increases blood loss (1). The rate of morbidity and mortality is high in patients with massive haemorrhage.

Massive haemorrhage is defined as the blood loss that is equal to the circulating total blood volume (TBV) within a 24-h period or blood loss that necessitates more than 10 units of red blood cell (RBC) suspension within a 24-h period. However, early recognition of massive haemorrhage and early administration of fresh frozen plasma (FFP) have been reported to reduce mortality (2-4). Therefore, some countries have recently proposed a new definition for massive haemorrhage, which is different from the current standard definition. For example, massive haemorrhage is defined as blood loss of 50% of circulating TBV within a 3-h period or transfusion of four or more units of RBC suspension within the first hour, blood loss exceeding the circulating TBV within a 6-h period or transfusion of five units of RBC suspension within the first hour, and most institutions have adopted the transfusion of blood products with high FFP/RBC suspension ratio (mean, >0.5) and high platelet/RBC suspension ratio (mean, >0.5 or >0.08) (5, 6). This study presents a patient with uncontrolled bleeding that was sustained after injury to the iliac vascular structures during THA revision, which necessitated massive blood transfusion under combined spinal epidural anaesthesia, and who was later discharged from the hospital without any complications.

Case Presentation

A 44-year-old female patient weighing 45 kg with known asthma, ASA physical status III and body mass index of 17 underwent revision THA. Consent for publication of this study was obtained from the patient. The patient was pre-medicated with 0.03 mg kg^{-1} IV midazolam before she was moved to the operating theatre. Standard monitorization was performed during the operation.

The patient was placed in a seated position for the administration of the combined spinal epidural anaesthesia. After aseptic skin preparation, nerve block was achieved by introducing the needle into the L4-L5 intervertebral space. Before the nerve block, a local anaesthetic solution (2% lidocaine) was infiltrated into the skin and subcutaneous tissues using a 25-G needle. The epidural space was accessed with an 18-G epidural Tuohy needle, through which a 27-G spinal needle was passed to ac-

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cess the subarachnoid space and 10 mg of 0.5% bupivacaine was administered within 30 s. Then, an epidural catheter was inserted, and the operation was initiated after placing the patient in the lateral decubitus position. During the operation, 10 ml of 0.125% bupivacaine was administered through the catheter at certain intervals.

The patient remained haemodynamically stable until the third hour of the operation and had gradual haemorrhage up to a volume of 2000 cc. At the third hour of the operation, acute blood loss occurred because of an injury to the iliac vascular structures, and the patient abruptly developed hypotension. Blood pressure was 77/47 mmHg after administration of 10 mg ephedrine. Besides that, the patient developed two other transient hypotension episodes during the entire operative period. The infusion of crystalloid and colloid solutions and replacement of blood products that simultaneously occurred with the haemorrhage continued until the completion of the operation. The estimated total blood loss was calculated as 2600 cc, and during 5.5 h of operation, the total volume of haemorrhage was 2000 cc before and 5300 cc after injury to the iliac vascular structures (total, 7300 cc). The amount of haemorrhage was calculated considering the blood in the aspirator, gauze compresses, pads and bleeding in the operation site. In replacement therapy, 5000 cc crystalloid solution, 2500 cc colloid solution, 12 units of RBC suspension, six units of FFP and two units of apheresis platelet suspension were administered. In addition to replacement therapy, supportive therapy was administered with ephedrine infusion during abrupt hypotensive episodes (total dose, 20 mg). The patient was conscious, cooperative and orientated throughout the operation. Sedation was achieved with intravenous administration of midazolam at a rate of 0.03 mg kg^{-1} at certain intervals. The total urine output was 200 cc $hour^{-1}$ throughout the operation. The patient was monitored with an hourly arterial blood gases analysis, and the results of perioperative arterial blood gas values are shown in Table 1. The patient was administered 5000 units of intravenous heparin during the repair of the iliac artery. The patient was moved to the post-anaesthesia care unit (PACU) after surgery. She received two more units of RBC suspension in PACU. The results of pre- and postoperative biochemical tests and coagulation test results are presented in Table 2.

Troponin and fibrinogen levels were within normal ranges in the postoperative period. The patient achieved an Aldrete score of 9 in the postoperative 24th hour, and she was moved to the regular ward. After 15 days, the patient sustained a femur shaft fracture during mobilization attempts, after which she underwent repair surgery, and she was discharged from the hospital without any complications 30 days after the operation.

Discussion

Haemorrhage during revision THA can cause significant complications in the perioperative period. The risk of haemorrhage was higher than usual because this patient was scheduled for the fourth revision THA. Because of the fact that combined spinal anaesthesia is routinely used in THA at our clinic, the patient also underwent combined spinal anaesthesia. Although switching to general anaesthesia was considered

Table 1. Intra- and post-operative arterial blood gas values

	Hour	PH	PO_2 (mmHg)	PCO_2 (mmHg)	HCO_3 (mmol L^{-1})	Hb (gr dL^{-1})	HCT (%)	Amount of bleeding (cc)
Intra operative ABG	1st hour	7.25	187	45	18.7	9.6	28	1200
	2nd hour	7.24	227	47	18.5	7.3	21	2500
	3rd hour	7.31	222	45	21.9	4.4	13	4500
	4th hour	7.23	245	47	18.9	2.0	<10	5750
	5th hour	7.23	192	54	20.2	7.4	22	7300
Postoperative ABG	1st hour	7.32	81	41	21.4	7.6	22	

ABG: arterial blood gas; PO_2: oxygen partial pressure; PCO_2: carbon dioxide partial pressure; Hb: haemoglobin; HCT: haematocrit

Table 2. Pre- and post-operative laboratory values

		HB (gr dL^{-1})	PLT (L)	PT (sn)	aPTT (sn)	BUN (mg dL^{-1})	CREA (mg dL^{-1})	Na (mmol L^{-1})	K (mmol L^{-1})	Ca (mg dL^{-1})
Preoperative		13.3	184	11.6	25.2	12	0.54	141	4.1	9.4
Postoperative	1st hour	7.4	78			8	0.45	144	4.3	6.6
	8th hour	9.7	74	14.3	26.7	12	0.53	143	4	7

Hb: haemoglobin; PLT: platelets; PT: prothrombin time; aPTT: activated partial thromboplastin time; BUN: blood urea nitrogen; CREA: creatinine

at first after the development of massive haemorrhage, this idea was soon abandoned because the patient was placed in the lateral decubitus position, difficulty in performing intubation, and changing the position would put the surgical team in a difficult situation; the patient was haemodynamically stable.

The estimated total volume of haemorrhage was three times her TBV, and although viscoelastic measure of coagulation is the most accurate measure in follow-up and replacement in such massive haemorrhages, this measurement was unavailable at our hospital. Johansson et al. (6) found that early FFP and platelet transfusion reduced the mortality rate in patients with massive haemorrhage. In another study by Johansson et al. (7), the transfusion of blood products with high FFP/RBC suspension ratio and high platelet/RBC suspension ratio had a favourable impact on survival. However, they did not clearly indicate the rates of FFP/RBC suspension and platelet/RBC suspension in their study. This rate was reported to be above 0.5 for FFP/RBC suspension ratio and above 0.13 or 0.5 for platelet/RBC suspension. The patient was administered FFP/RBC suspension at the ratio of 0.5, which is the mean value in the literature. In the study by Meibner et al. (4), early administration of FFP at high proportions was found to decrease capillary escape by protecting the endothelium, thereby reducing organ injury in support of the findings of Johansson et al., and they suggested administration of FFP to avoid coagulopathy without waiting for the haemostasis test results. Similarly, Cotton et al. (8) compared the outcomes with massive transfusion protocol involving the administration of 10 units of RBC suspension, four units of FFP and two units of apheresis platelet suspension with that of previous protocols, and they found that these patients received more blood products during surgery but achieved lower mortality within 30 days after the operation. In addition, this group of patients exhibited lower rates of pneumonia, pulmonary insufficiency and abdominal compartment syndrome. Similarly, this group of patients also had lower incidences of sepsis, septic shock or multi-organ failure. The requirement for transfusion in the first 24 h was lower in patients who were managed using this protocol; thus, they advocated that massive transfusion protocol corrected haemostasis (8, 9). Our massive transfusion protocol was similar to that used in the study by Cotton et al. because our patient received 12 units of RBC suspension, six units of FFP and two units of apheresis platelet suspension. The patient did not develop pulmonary, cardiac, neurological, renal or any other complications within a 24-h period after surgery. The patient did not develop any complications during follow-up in the regular ward, and she was discharged 30 days after the surgery.

Conclusion

This study suggests that the administration of blood products with high FFP/RBC and platelet/RBC suspension ratios in the early periods of massive haemorrhage without waiting for the haemostasis test results might prove beneficial in reducing the rates of intra- and postoperative complications. this study presents our experience with a patient who underwent THA and required a transfusion that was three times her estimated TBV. The patient was successfully managed with close monitoring of haemorrhage and timely administration of blood and blood products before hypotension and loss of consciousness occurred.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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References

1. Nelson CL, Stewart JG. Primary and revision total hip replasement in patients who are Jehovah's Witnesses. Clin Orthop Relat Res 1999; 369: 251-61. [CrossRef]
2. Gonzalez EA, Moore FA, Holcomb JB, Miller CC, Kozar RA, Todd SR, et al. Fresh frozen plasma should be given earlier to patients requiring massive transfusion. J Trauma 2007; 62: 112-9. [CrossRef]
3. Sinha R, Roxby D. Transfusion practices in massive haemorrhage in pre-intensive and intensive care. Vox Sang 2011; 101: 230-6. [CrossRef]
4. Meibner A, Schlenke P. Massive Bleeding and Massive Transfusion. Transfus Med Hemother 2012; 39: 73-84. [CrossRef]
5. Levi M, Fries D, Gombotz H, van der Linden P, Nascimento B, Callum JL, et al. Prevention and treatment of coagulopathy in patients receiving massive transfusions. Vox Sang 2011; 101: 154-74. [CrossRef]
6. Johansson PI, Oliveri RS, Ostrowski SR. Hemostatic resuscitation with plasma and platelets in trauma. J Emerg Trauma Shock 2012; 5: 120-5. [CrossRef]
7. Johansson PI, Stensballe J, Ostrowski SR. Current management of massive hemorrhage in trauma. Scand J Trauma Resusc Emerg Med 2012; 20: 47. [CrossRef]
8. Cotton BA, Au BK, Nunez TC, Gunter OL, Robertson AM, Young PP. Pre defined massive Transfusion protocols are associated with a reduction in organ failure and post injury complications. J Trauma 2009; 66: 41-8. [CrossRef]
9. Cotton BA, Gunter OL, Isbell J, Au BK, Robertson AM, Morris JA Jr, et al. Damage control hematology: the impact of a trauma Exsanguination protocol on survival and blood product utilization. J Trauma 2008; 64: 1177-82. [CrossRef]