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Case Series

Anaesthesia Section

Protocol Based Blood Management in Major Obstetric Haemorrhage- A Case Series

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ABSTRACT

Major obstetric haemorrhage remains the leading cause of maternal mortality globally. Irrespective of the etiology of haemorrhage, rapid and efficient intervention using proactive standardised protocols should gain precedence in the management of major obstetric haemorrhage. As the available resources vary between institutions, protocol specific to each institution is important for timely intervention. This case series reports a few successfully managed cases of obstetric haemorrhage by the implementation of institution based Massive Transfusion Protocol (MTP). Two antenatally diagnosed patients with placenta percreta had elective hysterectomy with bladder repair. The massive haemorrhages in both these cases were managed efficiently with the use of MTP without any sequelae. Another case of atonic Postpartum Haemorrhage (PPH) which did not respond to first line management also was treated successfully with the prompt activation of protocol. A case of uterine rupture with haemorrhagic shock was managed with massive transfusion according to protocol and vasopressors and she survived with no major side effects. A case of traumatic PPH which presented with severe anaemia (Hb 4.6 gm/dL) could also be successfully resuscitated by the timely activation of MTP.

Keywords: Blood transfusion, Hysterectomy, Massive transfusion protocol, Postpartum

INTRODUCTION

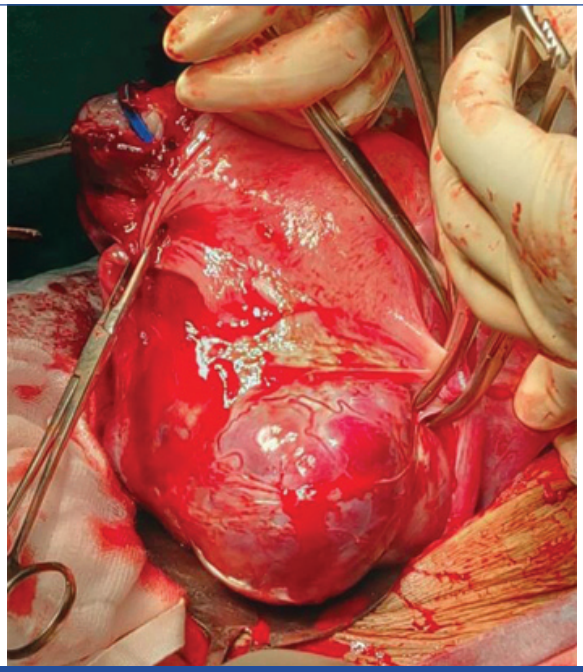
Worldwide maternal mortality rate ranges from 15 per 1,00,00 live births to 443 per 1,00,00 live births according to the varied socio-demographic index of different countries and haemorrhage is the foremost cause [1]. Major Obstetric Haemorrhage (MOH) refers to any kind of excessive bleeding in a parturient and is the most frequent cause of maternal mortality and morbidity worldwide. World Health Organisation (WHO) estimates it to be the single most leading individual cause of maternal death contributing to around 27% of all maternal deaths [2]. MOH is defined as a blood loss of more than one litre or a fall in haemoglobin of more than 4 g% after acute blood loss in a parturient or need for transfusion of four or more units of blood [3].

Surgical interventions, interventional radiological techniques and medical management with uterotonic drugs play a significant role in the control of obstetric haemorrhage. But rapid and efficient resuscitation should be the mainstay in such scenarios. Successful resuscitation hinges on timely and appropriate replacement of blood loss. Transfusion practices often vary between institutions depending upon availability of blood, blood products and point of care coagulation testing facilities. Hence, universal guidelines for transfusion management may not be relevant to all. Developing and adopting MTP with well-defined resuscitation goals and strategies individualised to the institution would go a long way to improve maternal morbidity and mortality related to MOH. Five cases of MOH are reported here which were successfully resuscitated according to the MTP developed in our institution.

CASE SERIES

Case 1

Patient was a 34-year-old Gravida 3 Para 2 Live 1(G3P2L1), with history of previous two caesareans. Magnetic Resonance Imaging (MRI) showed placenta percreta with urinary bladder infiltration. She underwent elective caesarean hysterectomy under general anaesthesia with lumbar epidural. Apart from standard monitors, Invasive Blood Pressure (IBP) and Central Venous Pressure (CVP) were monitored. Venous access included 7F triple lumen catheter in right Internal Jugular Vein (IJV) and two 16G peripheral cannulae. Anticipating massive haemorrhage, blood bank was already notified regarding the need for MTP and two units Packed Red Blood Cells (PRBC) was issued prior to surgery. Intraoperatively, bleeding started soon after the baby was delivered. Massive transfusion protocol was activated and she was resuscitated with a total of eight units each of PRBC, FFP and platelets, one pool of cryoprecipitate and 2.5 litres of crystalloids. Noradrenaline support was initiated to stabilise blood pressure. Surgical assistance by urologist was also obtained. The total intraoperative blood loss was estimated to be around 4.5 litres. Haemostasis was achieved and coagulation profile was normal towards the end of surgery that lasted for about four hours. Postoperatively, she was shifted to critical care unit and given ventilatory support for six hours and she made a good recovery [Table/Fig-1].



[Table/Fig-1]: Placenta accereta.

Case 2

A 32-year-old patient, G3P2L2 with history of two caesareans and an uneventful antenatal period was referred as a case of ruptured uterus. She was in haemorrhagic shock with metabolic acidosis, hypothermia and coagulopathy and was taken up for emergency laparotomy under general anaesthesia.

Massive transfusion protocol was activated and four units O negative PRBC and two units AB FFP was issued initially followed by group specific blood. She was resuscitated with a total of nine units each of PRBC and Fresh Frozen Plasma (FFP), seven units of platelets, one pool of cryoprecipitate, 2 L of crystalloids and 0.5 L colloid through IJV catheter and two peripheral IV cannulae. Her BP was stabilised on noradrenaline support and she required sodium bicarbonate infusion for correction of metabolic acidosis. She underwent hysterectomy with internal iliac artery ligation. Estimated blood loss was about five litres. Postoperatively, she made a good recovery after elective ventilation for 12 hours. She did not have any sequelae of massive transfusion.

Case 3

Patient was a 19-year-old primi gravida with history of gestational diabetes on insulin who presented with atonic PPH after expulsion of fetus following intrauterine death at 39 weeks of gestation. She was not responding to uterotonics, uterine massage or rectal misoprostol. She was managed conservatively with Panicker's vacuum suction for 12 hours. MTP was activated following transfusion of initial four units of PRBC and she required resuscitation with eight units each of PRBC, FFP and platelets, one pool of cryoprecipitate along with crystalloids and noradrenaline infusion.

Case 4

A 33-year-old G3P2L2 and previous two caesareans, was referred as a case of placenta percreta with polyhydramnios. MRI showed placenta percreta with bladder rent of 3 cm. She underwent classical caesarean hysterectomy with bladder rent repair with urological assistance under general anaesthesia with lumbar epidural block. She was resuscitated via IJV catheter and large bore peripheral cannulae using MTP with six units each of PRBC, FFP, PRP and one pool of cryoprecipitate along with 2.5 L crystalloids. After surgery patient was ventilated for four hours and extubated thereafter. She made a good recovery and was followed-up for three months.

Case 5

A 21-year-old primi was rushed to the emergency operation theatre as a case of traumatic PPH following normal delivery. Per vaginal exploration was attempted under subarachnoid block from peripheral hospital, but apex of tear was not visible. Her haemoglobin (Hb) was 4.3 gm/dL and hence referred for expert management. She was transfused with two units PRBC and two units FFP during transport. She underwent exploratory laparotomy under GA. She required noradrenaline support and was resuscitated with six units of PRBC, four units of FFP and four units of PRP along with 2 L of crystalloids and 0.5L of colloid. She was ventilated in the critical care unit for six hours and extubated thereafter without any sequelae of massive transfusion.

DISCUSSION

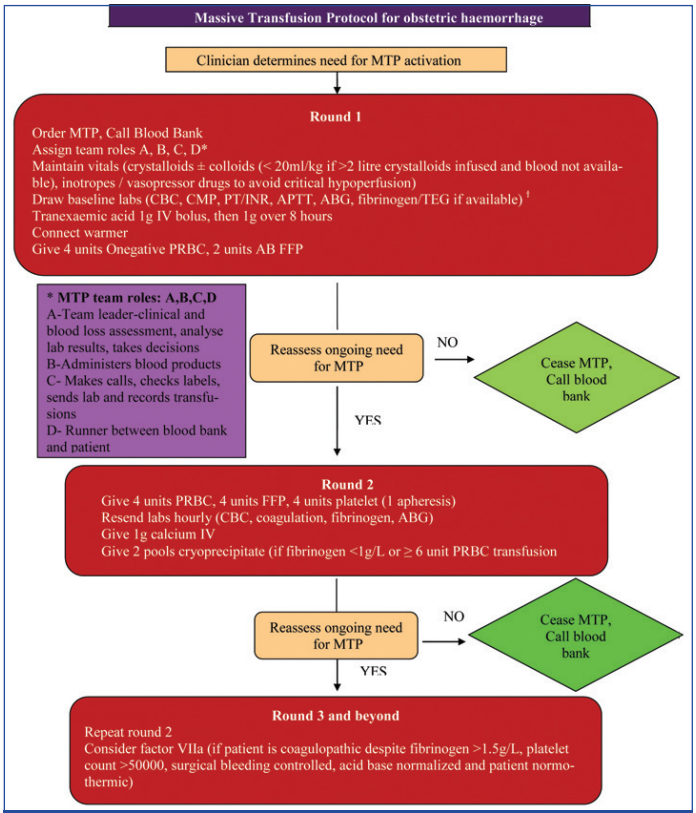
Poor outcomes following MOH and Massive Blood Transfusion (MBT) have been attributed to delayed treatment, unavailability of blood and blood products, inaccurate estimation of blood loss, absence of treatment protocols and poor communication among the team members involved in the immediate management [3]. A predetermined plan of action ensures timely intervention which is the most important factor that determines successful resuscitation. Blood transfusion strategies have changed over the last decade with emphasis on the use of FFP, platelets and fibrinogen [4]. Point of care testing for treating coagulopathies has further revolutionised the management of such cases [5].

Various definitions of MBT have been published in the medical literature such as [6]:

- Replacement of entire blood volume within 24 hour
- Transfusion of >10 units of PRBCs in 24 hour
- Transfusion of >20 units of PRBCs in 24 hour
- Transfusion of >4 units of PRBCs in one hour when on-going need is foreseeable
- Replacement of 50% of Total Blood Volume (TBV) within three hours.

Massive blood transfusion using proactive standardized protocols is the key to volume resuscitation in MOH. A systematic review of four retrospective observational studies on obstetric haemorrhage by Tanaka H et al., proposed a transfusion strategy optimised to the setting of MOH [7]. Revised guidelines by American college of obstetrician and gynaecologists on MTP recommended important protocol items to be determined at each institution [8].

Compiling the information from various MTPs in literature, a MTP [Table/Fig-2] suited to the resource setting of the study institution was framed and the same was used in all the aforementioned cases [4,9,10]. Early identification of the need for massive transfusion, good team work with assignment of specific roles to the team members, activation of blood bank personnel, preparation of essential equipment, monitors and drugs as well as resuscitation aimed at set targets with regular reassessments at regular intervals form the key elements of MTP.



[Table/Fig-2]: CBC complete blood count, CMP: Complete metabolic profile, PT: prothrombin time, APTT: Activated partial thromboplastin time, ABG: Arterial blood gas, TEG: Thromboelastogram.

The clinician determines the need for MTP activation if ≥4 units of PRBC transfusion is needed or expected. As soon as decision is made, blood bank is to be intimated verbally for initial release

of four units O negative PRBC and two units AB FFP in case group specific products are not available immediately and also for further release of group specific blood. Baseline laboratory and cross-matching sample are to be sent immediately. In the meantime, resuscitation should be started with crystalloids along with inotropic or vasopressor support to maintain mean arterial blood pressure. If more than two litres of crystalloids are infused and still blood is not available colloids may be used up to a maximum of 20 mL/kg [11]. Tranexamic acid should be given, as soon as possible in a dose of 1 g over 10 minutes and then over 8 hours [12,13]. Preparations for massive transfusion include securing adequate vascular access with 14G/16G peripheral IV cannulas and establishing CVP, IBP, urine output and temperature monitoring in addition to standard monitoring [14].

Regular reassessment of relevant laboratory investigations is important. Prompt communication with blood bank and manpower with assigned roles should be ensured. Inotrope or vasopressor drugs may be used to avoid critical hypoperfusion and to buytime for fluid resuscitation. Effective resuscitation is facilitated with rapid infusion pumps and warming devices. Resuscitation is continued with group specific blood and blood products as soon as available and depending on laboratory or clinical guidelines [4,9,15]. A multidisciplinary approach with prompt and proper communication between anaesthetists, obstetricians, surgeons and blood bank personnel is also of prime importance in successful resuscitation. Availability for postoperative ICU care should be ensured beforehand. Patient has to be reassessed after every four units of PRBC transfusion regarding the need for continuing MTP.

Setting of targets to stop MTP also is important because it helps prevent problems of over transfusion like circulatory overload, dilutional coagulopathy, electrolyte imbalances, hypothermia, transfusion related lung injury, sepsis etc., and allows judicious use of available resources. The proposed targets of resuscitation are as follows [14].

1. Mean Arterial Pressure (MAP)≥60, SBP ≥80-100 mmHg
2. Haemoglobin-7-9 g%
3. International Normalised Ratio (INR) <1.5, APTT <42 sec
4. Fibrinogen >1-1.5 g%
5. Platelet >50000/mm^3
6. pH 7.35-7.45
7. Core temperature >35 degree C
8. Lactates <2 mEq/L
9. Ionised Calcium (iCa) >1.1 mmol/L

There are many case reports of successful management of major haemorrhage using MTP in the literature. Jain N et al., in his report of a near-miss case of MOH highlights the importance of early use of point-of-care Thromboelastogram (TEG), tranexamic acid, timely activation of MTP, damage control resuscitation and surgery as well as multidisciplinary team work in the management of MOH [16]. Successful resuscitation was achieved in a 30-year-old G3P2 who developed atonic PPH and haemorrhagic shock following vaginal delivery after being managed with prompt MTP activation, use of TEG-guided correction of coagulopathy, and early hysterectomy. Postoperative intensive management of ventilatory function, haemodynamics, kidney function and sepsis contributed to a favourable outcome. TEG is not available in the index institution and laboratory results are not fast enough but the lesson learned from the case series is having an MTP in place and use of standardised supply of blood and products can help anaesthesiologist function well in a critical situation without major adverse sequelae of massive transfusion.

Lima SK et al., discuss the management of a 24-year-old complicated obstetric patient with profuse bleeding following caesarean who required massive transfusion [17]. She was resuscitated with total 117 units of blood products in spite of which she recovered fully with minimum complications as they followed the near standard blood transfusion protocol. In another successfully managed case of massive transfusion, Jain K et al., reports and comments that MTP is essential for the judicious use of blood products [18].

Thus, protocol-based management should be the dictum in all massive transfusions. The protocol developed in the study institution is based on recent recommendations modified to the resource setting and it emphasises the need for early identification of need for massive transfusion, need for adequate personnel each with assigned roles to optimise all aspects of care, avoids undue dependence on lab results, specific targets to avoid critical hypo perfusion as well as complications of over transfusion.

CONCLUSION(S)

A well defined hospital specific MTP allows trained providers to recognise patients at risk of high volume blood loss early, initiate MTP quickly and has specific end points to limit over transfusion. Through this case series, author recommend that each hospital should formulate MTPs suited to their needs and resources to improve survival in MOH.

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