Dear editor,

A cumulative blood loss ≥1,000 mL accompanied by hypovolemia within 24 hours after delivery regardless of the delivery route is defined as postpartum hemorrhage (PPH) which is called as primary PPH. However, secondary PPH occurs 24 hours after delivery up to 12 weeks postpartum which is more common during normal vaginal delivery but rarely seen after cesarean section (CS) (1). The PPH has been still the most common cause of maternal mortality and morbidity which has a rate of 13.1 in 100,000 live births in 2019 (2). The aim of this report is to address multidisciplinary approach to secondary (delayed) PPH in a patient 45 days after CS according to adapted massive transfusion protocol (MTP).

A 29-year-old parturient with abnormal bleeding was admitted 45 days after CS. Coagulation profile and fibrinogen before PPH diagnosis was not remarkable. The ultrasound was free of any retained placental products/subinvolution. Before PPH diagnosis was not remarkable. The ultrasound was free of any retained placental products/subinvolution.

We previously managed bleeding due to uterine atony/rupture after vaginal delivery by focusing on role of fibrinogen in the coagulation (3). Physiologically pregnant women have higher fibrinogen level and decreased fibrinolysis than non-pregnant population (4). Hereby, 1 g TXA and 2 g fibrinogen concentrates were given in the ward by the obstetricians before emergency surgery. We, anesthesiology team, managed goal directed coagulopathy therapy using ROTEM since fibrinogen level <2 g L⁻¹ and/or FIBTEM A5 <12 mm are considered to be predictive of severe hemorrhage as stated in the recent Maternity and Obstetrics Guidelines of the Turkish Ministry of Health (5) (Figure 1).

In conclusion delayed (secondary) PPH was successfully managed by multidisciplinary team approach after early activation of adapted MTP that includes trigger and target values guided by ROTEM and/or standard tests for avoiding unnecessary transfusion that can possibly increase mortality and/or morbidity.

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Surgical and Anesthetic Management of Postpartum Hemorrhage Forty-Five Days After Cesarean Section

Sezaryenden Kırkbeş Gün Sonra Postpartum Kanamanın Cerrahi ve Anestezi Yönetimi

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**Figure 1:** Adapted massive transfusion protocol for postpartum hemorrhage of national maternity and obstetrics guidelines.

**Major PPH**

Blood loss ≥ 1500 mL and ongoing bleeding

**Order 1st Shock pack**

Consider surgical and non-surgical techniques - transfer of the patient to the OR
Maintain normovolemia by management of hemodynamics and volume status
Monitor noninvasive cardiac output (if available in your unit)
Consider invasive arterial/central monitoring
Replace fluid up to 3.5 L (2 L isotonic crystalloid + 1.5 L colloid preferably gelatin) until blood arrives
Transfuse RBC if required clinically hematomatically
Transfuse O Rh(-) blood of specific group-blood type is unknown
Repeat 1 g IV TXA (IV infusion within 10 min)
Consider of cell salvage (if available)

**NO**

Check out whether standard laboratory or POC tests arrived or not

**YES**

**Cell blood bank to order**

**2nd Shock pack**

4 U RBC+4 U FFP+1 U apheresis plt
Consider ratio driven protocol
RBC: FFP: Plt / 1:1:1
Check blood gas analysis and complete blood count

**If bleeding continues**

**Order 3rd Shock pack**

2 U Crioprecipitate + 1 U apheresis plt

**Administer**

25-50 mg kg⁻¹ IV fibrinogen concentrate or 4-6 mL kg⁻¹ Crioprecipitate (1 unit/10 kg)
If fibrinogen <2 g L⁻¹ or FIBTEM A5 < 12 mm
Administer IV 15-20 mL kg⁻¹ FFP (If APTT/INR 1.5 fold of normal or EXTEM CT > 75 sec)
Transfuse 1 U plt apheresis (if platelet <50,000/µL)
Prevent hypothermia
Optimise oxygenation & acid-base status (pH > 7.2, lactate < 2 mmol L⁻¹ and BE > -6)
Provide calcium homeostasis (>1 mmol L⁻¹)

Hysterectomy would be life-saving (ongoing bleeding despite all measures)

RBC: Red Blood Cell
Plt: Platelet
APTT: Activated partial thromboplastin time
INR: International normalized ratio
POC: Point of Care
AUTHOR CONTRIBUTIONS

Conception or design of the work: DBG, NCE, MFCA
Data collection: AB, EIB
Data analysis and interpretation: DBG, NCE
Drafting the article: DBG, NCE
Critical revision of the article: MFCA, DBG
Other (study supervision, fundings, materials, etc): AE, EIB

All authors (MFCA, NCE, DBG, AB, EIB, AE) reviewed the results and approved the final version of the manuscript.

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