The modern implementation of patient blood management (PBM) in Malaysia: the use of intravenous iron in severe anaemia with iron deficiency – A Case Report

Ananthi Krishnamoorthy, MD[1], Farid Hadi, Dip Palliative Care[2], Aruku Naidu, FRCOG[3], Jameela Sathar, FRCPath[4]

[1] Department of Rehabilitation Medicine, Hospital Raja Permaisuri Bainun, Ipoh, [2] Vifor Pharma Asia Pacific, Singapore, [3]Department of Obstetrics and Gynaecology, Hospital Raja Permaisuri Bainun, Ipoh, [4] Department of Haematology, Hospital Ampang Selangor

SUMMARY
Anaemia is a common condition in Malaysia, and is mostly due to iron deficiency. In many cases, allogeneic blood transfusion (ABT) is administered unnecessarily to treat anaemia. Patient blood management (PBM) is a concept whereby a patient becomes his or her "own blood bank", instead of receiving ABT. The concept encompasses three pillars namely optimising erythropoiesis, minimising blood loss and harnessing human physiological reserve. We present a safe and fruitful outcome of managing severe anaemia without utilising any ABT, made possible with the PBM approach including administration of intravenous iron.

KEY WORDS:
Severe anaemia, Iron deficiency, Patient Blood Management (PBM), 3 pillars of PBM, IV Iron sucrose

CASE REPORT
A 21-year-old Indian woman, Jehovah's witness with no known comorbidities, presented to the Emergency department with heavy vaginal bleeding for five days, associated with light-headedness, palpitation, weakness and fatigue. She reported six months history of amenorrhea with subsequent severe menorrhagia.

Physical examination revealed blood pressure of 90/50 mmHg and heart rate of 90 bpm. She was afebrile and pale. There were no other significant clinical findings. Her haemoglobin (Hb) was 4.9 g/dl (normal range: 12.1-15.1 g/dL), mean corpuscular volume (MCV) was 81.9 femtoliter (normal range: 80-100 fl) and red cells distribution width (RDW) was 14.5% (normal ranges: 11-15%). Platelet count and coagulation profile was normal. Electrocardiogram (ECG) showed no ischaemic changes. Urine pregnancy test was negative. She received initial management of intravenous (IV) Tranexamic acid with crystalloids and colloids resuscitation, supported with supplemental facemask oxygen 5 L/min. Bleeding was arrested within five hours of Tranexamic acid infusion in the Emergency Department.

Iron studies revealed serum iron 4 µmol/L (normal range: 11.6-31.7 µmol/L), total iron binding capacity (TIBC) 60 µmol/L (normal range: 45-66 µmol/L) and serum ferritin 7.8 µg/L (normal range: 15-150 µg/L). Serum transferrin saturation (TSAT) calculated was 6.25% (normal range: 20-50%). Ultrasound of pelvis was normal. Diagnosis was severe iron deficiency anaemia secondary to menorrhagia from dysfunctional uterine bleed (DUB).

A major challenge in this case was that ABT was not an option due to her religious belief. To replace iron stores while facilitating rapid haemoglobin increase, intravenous iron was administered. A cumulative iron dose of 1400 mg was calculated by Ganzoni Formula, using baseline Hb 4.9 g/dL, body weight 60 kg and target Hb 11 g/dL, delivered over a total of seven infusions.

During the acute phase, IV Tranexamic acid was administered and then converted to oral towards discharge. Phlebotomy was minimised to once a week during severe anaemia to prevent further blood loss. Further bleeding was prevented with omeprazole 20 mg daily. She received daily Dydrogesterone 10 mg for hormonal treatment of her menorrhagia. At day five of admission, she developed mild right unilateral visual impairment and diagnosed with right eye ischaemic neuropathy.

She was discharged on Day 13, after Hb of 5.6 g/dL when clinically stable with plans to complete the remaining two of the total seven infusions in the following weeks. The illustration of Hb evolution is described in the following graph (Figure 1). Follow-up after discharge demonstrated successful outcome with normalised haemoglobin within a month and sustained increase within a year.

Patient Blood Management (PBM)
PBM is the timely application of evidence-based medical and surgical concepts designed to maintain haemoglobin concentration, optimise haemostasis & minimise blood loss in an effort to improve patient outcome.[1] The PBM concept consist of three pillars; (1) Optimise erythropoiesis (2) Minimise blood loss and bleeding (3) Harness and optimise the physiological reserve of anaemia. The implementation of PBM has reduced rates of ABT, reduced incidence of infections, improved surgical outcomes, reduced length of hospital stay and reduced rates of re-admissions.[2]

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Corresponding Author: Ananthi Krishnamoorthy, Rehabilitation medicine registrar, Rehabilitation Medicine Department, Hospital Raja Permaisuri Bainun, Jalan Raja Ashman, 30450 Ipoh, Perak, Malaysia
Email: ananthi.k8@gmail.com

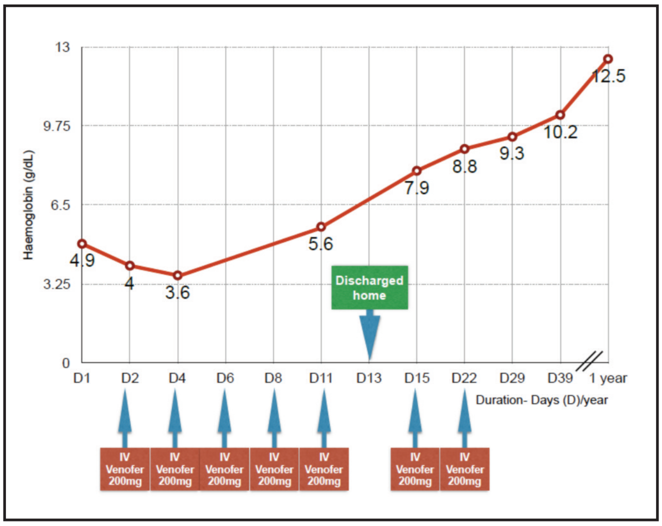

Fig. 1: Haemoglobin evolution following administration of intra-venous Iron sucrose observed in one year.

Despite numerous successes of PBM, it is a challenge to implement it in Malaysia. Among the barriers are misguided fearful perceptions of IV Iron related anaphylaxis, lack of knowledge of PBM, the impression that it's too complicated to use, and the alarming misconception that blood is safe, effective and cheap.

This case clearly defies these challenges and illustrates with the use of three-pillar strategy (as discussed below), how PBM can be utilised safely and easily even in severe anaemia.

Optimise erythropoiesis
Ascertaining the root cause of anaemia (of which iron deficiency is most common) and treating appropriately are key to optimising erythropoiesis. Although oral iron is first line treatment of iron deficiency, it is related to poor tolerance and takes months to replenish iron. Intravenous iron is safe and effective when rapid increase in Hb and iron supply is required. Iron sucrose was the treatment of choice due to its extensive safety and efficacy profiles.[3] Another measure to optimise erythropoiesis namely erythropoiesis-stimulating agents (ESA), was not used here in view of expected high levels of endogenous erythropoietin in response to blood loss in an otherwise healthy individual.

Minimise Blood Loss
In severe anaemia especially, aggressive, vital PBM measures to minimise blood loss are essential. In this case, unnecessary phlebotomy was minimised, tranexamic acid was used as haemostatic agent and early administration of proton-pump inhibitor (Omeprazole) to prevent bleeding from stress ulcers was done

Harness and Optimize Physiological Reserve of Anaemia
Human body develops tolerance to anaemia when acute bleeding occurs. However, each patient and organ has specific oxygen demand in a given situation. Therefore, harnessing physiological reserve of anaemia is essential and is done through careful assessment to consider aggressively providing oxygen support and possible vasopressor support especially at low Hb levels. The ischaemic neuropathy experienced by this patient might be attributed to lack of aggressive oxygenation during the lowest Hb levels, a lesson we can learn.

In conclusion, PBM offers safer approach to improve patient outcome. This case reiterates that PBM can be implemented with ease and success, and it is hoped that this example will propel the use of PBM in Malaysia.

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