

# Role of Manual Red Cell Exchange Transfusion in Management of Refractory Methemoglobinemia

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## 1. Introduction

Acquired methemoglobinemia is a potentially lethal complication of various oxidative chemicals. In most patients symptoms are mild and resolve without specific therapy, however severe cases require treatment with intravenous 1% methylene blue<sup>1</sup>. In cases refractory to methylene blue, hyperbaric oxygen or red cell exchange transfusion can be beneficial<sup>2</sup>.

Red cell exchange can be done manually or by apheresis equipment's, the principle of which is removing patient's red cells, with concomitant replacement with AHG crossmatch compatible donor cells. Manual red cell exchange in a patient with acquired methemoglobinemia is presented.

## 2. Case Report

A 23year old male, presented to the emergency department with history of alleged oral intake of pesticide (PHALCON BOTANICAL). Patient was conscious, coherent with symptoms of shortness of breath and palpitations.

On examination, he had bluish discoloration of lips, tongue, nose, palms and nails i. e., both central and peripheral cyanosis was noted as in figure 1 and 2. Pulse oximetry revealed oxygen saturation (SpO<sub>2</sub>) of 75% with 6L of oxygen by mask. He was hemodynamically stable. All other systems were within normal limits.



Figure 1: Bluish Discolouration of Tongue



Figure 2: Bluish Discolouration of Fingers

## 3. Investigations

Arterial blood gas analysis revealed chocolate brown colored blood with pH 7.43, PaO<sub>2</sub> 158mmHg, PaCO<sub>2</sub> 31.8mmHg, bicarbonate 21.1mmol/L. Pseudocholinesterase level was 6770IU/L (5440 - 13, 200IU/L) was normal.

Complete blood picture showed hemoglobin 13.5gm%, platelet count 2.6lakhs/mm<sup>3</sup>, WBC count raised to 17, 500/mm<sup>3</sup> with neutrophilic leukocytosis.

High PaO<sub>2</sub> and low SpO<sub>2</sub> values, cyanosis not responding to oxygen, chocolate brown colored blood suggested a diagnosis of acquired methemoglobinemia.

## 4. Treatment

Oral Ascorbic acid (1000mg) and intravenous 1% methylene blue was started. Despite the treatment with methylene blue,

patient had no symptomatic improvement. Then a single volume manual red cell exchange was planned. After a bolus infusion of 500ml normal saline, 400ml of whole blood was withdrawn and 1 unit of AHG cross match compatible packed red blood cells (PRBC) was transfused. This cycle was repeated another four times over a time period of 6 hours. Simultaneous slow infusion of normal saline was given to the patient throughout the procedure.

Meanwhile patient's heart rate, blood pressure and oxygen saturation with pulse oximetry were monitored. 3 hours after the procedure, SpO<sub>2</sub> increased to 93% and central cyanosis (lips and tongue) decreased. Peripheral cyanosis in palms and nails subsided within 24 hours. Patient had a full recovery with raised oxygen saturation without any oxygen supply. Arterial blood gas analysis was normal. Patient discharged after 6 days.

## 5. Discussion

Methemoglobin is produced when normal ferrous ion in heme complex of hemoglobin is oxidized to ferric ion which does not combine with oxygen. MethHb shifts oxygen dissociation curve to left. This results in tissue hypoxia and cyanosis.

For patients not responding to standard treatment like methylene blue and ascorbic acid, hyperbaric oxygen or red cell exchange transfusion can be lifesaving. Red cell exchange can be done manually or by apheresis machine. Apheresis equipment may not be available in all centers, so manual technique can be opted.

## 6. Conclusion

Manual Red cell exchange is a safe and effective mode of therapy in cases with acquired dysmethemoglobinemia in centers with limited resources.

## References

- [1] Michael A. Pritchett, DO; Nathalie Celestin, MD; Nicole Tilluckdharry, MD; Katherine Hendra, MD; Peter Lee, MD. Successful Treatment Of Refractory Methemoglobinemia With Red Blood Cell Exchange Transfusion. CHEST Journal. 2006, Volume 130, no.4, 15 - 16
- [2] Sibabratta Patnaik, Manivachagan Muthappa Natarajan, Ebor Jacob James, and Kala Ebenezer. Methylene blue unresponsive methemoglobinemia. Indian J Crit Care Med. 2014, Apr; 18 (4): 253–255.