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Case Report

Herbicide poisoning assocaited methhemoglobinemia as a cause of hypoxia — approach & emergency management — A case report

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ABSTRACT

Methhemoglobinemia — is a altered form of hemoglobin which is associated with impaired O2 transport to body tissues, precipitate by deliberate ingestion of herbicide (larvicide). We report a case with severe methhemoglobinemia due to ingestion of herbicide containing biological extracts & fillers marketed as safe. This is suspected when there is low O2 saturation and disparity between SpO2 level & PaO2 level, timely managed with Methylene Blue & Ascorbic acid as antidote.

1. Introduction

India has multiple incidences of suicides by consuming insecticides containing organophosphates, organochlorates & herbicides. Here we got a case with herbicide associated Methhemoglobinemia. Methhemoglobinemia is a fatal condition where ferrous part of heme in hemoglobin is oxidized to ferric form which results in decreased oxygen carrying capacity of hemoglobin.[1] As physiology says it results into shifting of OXYGEN DISSOCIATION CURVE to left.[2] G6Pd level measurement is necessary in case with Methhemoglobinemia. Two forms of Methhemoglobinemia one is congenital a rare one, another more common acquired.[2–4]

2. Clinical Case

A 38-year-old male with previous history of addiction of alcohol, no other comorbidities, presented to emergency department at our with deliberate consumption of approximate 100 ml of liquid (Botanical for larvicide) marketed as XYZ brand, nearly one hour prior. He was presented with history of vomiting 5-6 episodes since ingestion with mild uneasiness in chest & breathlessness. On examination, he was conscious oriented HR-110/min, BP-176/106mmhg, Spo2-86% (room air), RR-20/min, CVS-Mild Tachycardia, no murmur, RS- few adventitious sounds +, no wheeze, or crepitation, CNS-WNL (all four limb power normal), RBS-123, he was managed with gastric lavage through Ryle's tube insertion, Inj. PPI & Inj. Antiemetics, after putting O2 by oxy-mask Spo2 was 88% even on 8liters of oxygen, & later on NRBM Spo2 recorded as 90% on 15liters/min of Oxygen on admission.

His ABG trend is described in Table 1, which is suggestive of methhemoglobinemia, after giving Inj. Methylene blue & Vitamin C IV, his O2 saturation improved to 98% on day 2 of admission. On day 3 & 4 patient became hemodynamically stable with normal vital parameters.

2.1. Specific treatment given for methhemoglobinemia

Inj. Methylene blue 50mg in 100 ml NS IV over 1 hour. Inj. ScorbiaXT (Vitamin C)/ Ascorbic acid in 100 ml NS

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Table 1:

Parameter	Day 1 (on admission)	Day 2	Day 3	Normal ranges
Ph	7.38	7.43	7.42	7.35-7.45
PCo2	35.4	32.7	35.0	35-45
PO2	144.2	328	98	83-108
HB	14.0	13.1	12.9	12-17.5
So2	82.4	98.1	95.2	95-99
MethHB	39.4	4.8	5.2	0-3.0
NA+	146	140	138	135-145
K+	3.8	3.9	3.6	3.5-5.0
Lac	1.8	0.9	1.2	0.5-1.6
HcO3	21.7	23.3	23.9	23-24
WBC	8000			4000-10000
HCT	44.30			40.0-50.0
Platelet	327000			150-410
Blood urea	18.9			17-43
Creatinine	0.9			0.71-1.18

Table 2: Clinical course in ICU & ward

Vital	Day 1 / ICU	Day 2 / ICU	Discharge /At ward
Consciousness	Conscious, Oriented	Conscious, Oriented	Conscious, Oriented
Limb power	Normal	Normal	Normal
HR/min	102	78	87
BP mm hg	160/100	140/86	130/70
Spo2 %	88 (NRBM)	94 (Nasal Cannula)	94 (room air)
O2 requirement Lit/min	15 lit/min	4 lit/min	off O2
Urine output /day	400	1800	1600
Temperature	Afebrile	Afebrile	Afebrile

Table 3: Level of methemoglobin & outcome

Methemoglobin %	Sign & symptoms
<15%	Asymptomatic
20-30%	Cyanosis, headache, fatigue, syncope, exercise intolerance.
30-50%	Shortness of breath & headache
50-70%	Lethargy, stupor, dysrhythmias, seizures, coma
>70%	Death

Causes	
Drugs	: Phenytoin, Nitroglycerin, Dapsone , Local anesthetics [4]
Insecticide/Herbicide	: Rich in biological extracts, stabilizers & fillers, [1,2,4], Nitrates &Nitrites [2]
Occupational exposure	: Nitrobenzene aniline (Aromatic nitro compounds in Petrochemical plants)
Fumes	: Exhaust from internal combustion engines [4]
Food	: Chines sausages, [2] refrigerated "dim-sum" stuffed pork [2]

IV Over 1 hour. Prophylactic Antibiotic: Inj. Amoxicillin. Symptomatic treatment for nausea & vomiting, Hydration therapy 2.5 liters per day, for 3 consecutive days.

3. Discussion

As we are aware, when blood levels of Methhemoglobinemia rises above 2% it is labeled as Methhemoglobinemia. [1] Usual pattern of signs & symptoms are cyanosis, low O2 saturation, normal PaO2 (arterial oxygen in ABG) [1] it is found that there is mismatch & disparity between measured Spo2 & PaO2 without any presence of evolving cardiac & respiratory system abnormality which makes to think about suspicion of Methhemoglobinemia. [2] Patient has headache, nausea, vomiting, cynoderma in early stage of toxemia. [1] There is altered mental sensorium progressing to drowsiness, seizures, coma & death in later stages of critical illness. [1] Insecticides containing biological extract are rich in nitrogenous products, stabilizers & fillers. Methylene blue is treatment of choice in patients other than G6PD deficiency, [2] Ascorbic acid is main stay of treatment in G6PD deficient

Fig. 1: Chest Radiograph: Within normal limits

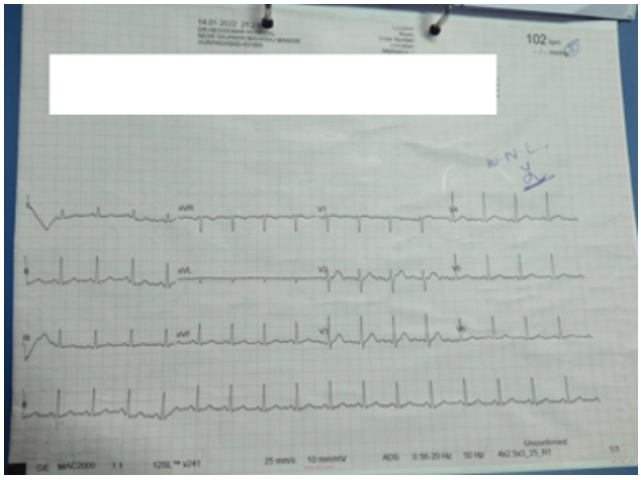

Fig. 2: Electrocardiograph: within normal limits, normal sinus rhythm

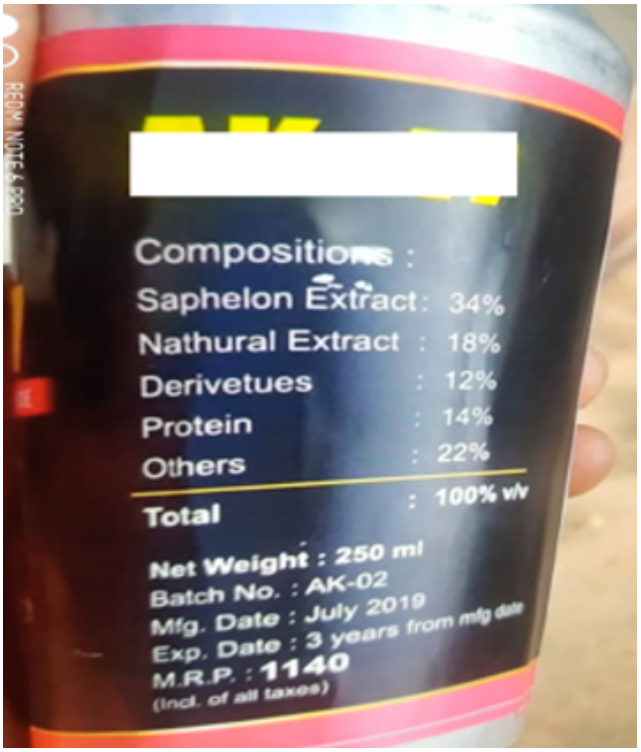

Fig. 3: Herbicide used by patient

individuals as methylene blue precipitate hemolysis in these group.[2] Various diagnostic methods include O2 saturation gap (CO-OXIMETRY),[3] multiple wavelength spectrophotometry,[3] filter paper test,[3] potassium cyanide test.[3] Two forms of Methhemoglobinemia one is congenital a rare one, another more common acquired.

Methhemoglobinemia is associated with brownish discoloration of blood & urine, when blood level goes above 70% reflects with fatal outcome.[2]

4. Conclusion

Timely suspicion and early management of hypoxia associated with herbicide ingestion as a possibility of methhemoglobinemia should be considered and it will become an eye-opener for Intensivist & Physician in Emergency Care Unit. Management with methylene blue as an antidote helps in early recovery & good outcome of patient without G6PD deficiency.[5–8]

Disparity between PaO2 & SpO2 with rise in Meth HB is acquired cause of herbicide associated methhemoglobinemia. Ascorbic acid penetrates RBC's, stabilizes the membrane & prevents hemolysis works as co factor for NADP reductase for glutathione metabolism hence treatment of choice in G6PD deficient individuals.

5. Source of Funding

None.

6. Conflict of Interest

None.

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