Two Case Reports of Occupational Exposure of Aniline Dye and Causing Methemoglobinemia

Manas Parikh\(^1\), Nima Thakkar\(^2\), Dr. Jayesh J Dutt\(^3\), Dr. Ibrahim Malek\(^4\)

\(^1\)3\(^{rd}\) Year Medicine resident, Department of General Medicine, AMC MET Medical College & Sheth LG Hospital, Ahmedabad, India
\(^2\)2\(^{nd}\) Year Medicine resident, Department of General Medicine, AMC MET Medical College & Sheth LG Hospital, Ahmedabad, India
\(^3\)Professor of Medicine, Department of General Medicine AMC MET Medical College & Sheth LG Hospital, Ahmedabad, India
\(^4\)Assistant Professor, Department of General Medicine, AMC MET Medical College & Sheth LG Hospital, Ahmedabad, India

Abstract: Aniline is a chemical use mainly in the manufacturing of perfumes, dyes, paint removers, pesticides and photographic materials. At room temperature it is simplest aromatic amine, is clear to slightly yellow oily liquid that darkens to a brown color on exposure to air. When aniline exposure occur it rapidly absorbs from the lungs and leads to systemic toxicity. Aniline compounds cause oxidative stress which leads to methemoglobinemia and hemolytic anemia may land the patient in critical conditions.

Keywords: Meth Hb Aniline dye Methylene blue Methyhemoglobin

1. Introduction

- Aniline is a chemical use mainly in the manufacturing of perfumes, dyes, paint removers, pesticides and photographic materials.
- At room temperature it is simplest aromatic amine, is clear to slightly yellow oily liquid that darkens to a brown color on exposure to air.
- When aniline exposure occur it rapidly absorbs from the lungs and leads to systemic toxicity. Aniline compounds cause oxidative stress which leads to methemoglobinemia and hemolytic anemia.

2. Case Report 1

History
- A 52 year male patient a factory worker brought to LG hospital on 14th July 2020 with alleged history of exposure to unknown substance (Aniline dye) With complain of
  - Discoloration of skin since 4 days
  - Breathlessness sudden onset
  - Swelling of face, lips and neck region

Vitals and examination
- PULSE - 112/min
- BP - 134/80 mmhg
- RR - 28 - 30/min
- RS - bilateral expiratory rhonchi present
- Cvs - s1s2 +
- Cns - conscious and oriented
- SpO2 - not recordable

Investigations
- Hemoglobin - 14.6gm/dl
- Total count - 16640
- Differential - 90/5/3/2
- Platelets - 1.67 lakh
- Mcv - 106 FL
- Urea - 24 mg/dl
- Creat - 1.1mg/dl
- Sodium - 129 meq/lit
- Pottasium - 3.8 meq/lit
- Chloride - 95
- Bilirubin - 0.9 mg/dl
- SGPT - 37 unit

Methhb level - 46.2%
- ABGA
- PH - 7.42
- PO2 - 55
- PCO2 - 42
- SO2 - 93.6%
- HCO3 - 26.0
- G6PD deficiency –not detected

3. Case Report 2

History
- A 20 year male patient a factory worker brought to LG hospital on 17th July 2020 with alleged history of exposure to unknown substance (?Aniline dye) due to drowning in tank of dye at his work place
  - With complain of
  - Discoloration of skin
  - Sudden onset breathlessness

Vitals and examination
- P - 120/MIN
- BP - 110/70 MMHG
- RR - 30/MIN WITH RESPIRATORY DISTRESS
- RS - rhonchi present
- Cvs - s1s2 +
- Cns - conscious and oriented
- SPO2 - 98% WITH BIPAP support

Investigations
- Hemoglobin - 17.9 gm/dl
- Total count - 28230
- Differential - 85/10/04/01

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Platelets - 1.45 lakh
Mcv - 70 FL
Urea - 20 mg/dl
Creat - 1.2 mg/dl
Sodium - 120 meq/lit
Pottasium - 3.1 meq/lit
Chloride - 89 meq/lit
Bilirubin - 0.8 mg/dl
SGPT - 30 unit

Methhb level - 4.8%
ABGA
PH - 7.22
PO2 - 48.9

PCO2 - 49.2
SO2 - 77
HCO3 - 20
G6PD deficiency –not detected
Both pt treated with inj. methylene blue 1mg/kg iv over 10mins
may repeat dose 1 hour later if methHb level remains >30% or symptoms persists
Repeat methhb level

Case 1 - <1%
Case 2 - 2.8%

4. Discussion

Methemoglobin (MetHb) is a modified form of normal hemoglobin where Fe2+ (ferrous ion) is oxidized into Fe3+ (ferric ion).
MetHb cannot bind with oxygen and hence cannot carry oxygen. The human body can tolerate a very small amount (<1%) of MetHb and higher level causes methemoglobininemia.

Exposure to aniline dye leads to oxidative stress causing RBC destruction leads to hemolytic anemia and it is aggravated if G6PD deficiency present.
The diagnosis of methemoglobinemia is based on the results of an arterial blood gas examination and measurements of methHb concentration in blood.
5. Conclusion

Both patients had life threatening methemoglobinemia due to aniline dye exposure but timely intervention by resuscitation and inj. methylene blue as antidote could revive the pt.