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Case study of Dapsone Induced Methemoglobinemia

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ABSTRACT

Methemoglobinemia is a condition where the iron in hemoglobin, the protein in red blood cells that carries oxygen, is oxidized. This oxidized form, methemoglobin, cannot bind to oxygen as effectively, leading to a decrease in oxygen delivery to tissues. Here is a case of dapsone induced MethHb and is reported in young female with central cyanosis and was treated successfully with Methylene blue.

Keywords: cyanosis, methemoglobinemia, Dapsone, methylene blue.

INTRODUCTION

Dapsone, a medication used to treat various conditions like leprosy and certain inflammatory skin conditions, can induce methemoglobinemia.[1] This occurs because dapsone can oxidize the iron in hemoglobin, leading to the formation of methemoglobin.[2]

Methemoglobinemia is a rare and potentially life-threatening condition characterized by the decreased oxygen-carrying capacity of hemoglobin due to the conversion of iron from the reduced ferrous (Fe2+) state to the oxidized ferric (Fe3+) state, which makes it incapable of binding oxygen molecule.[3–6] Cyanosis occurs when 10-25% of the total hemoglobin turns into methemoglobin.[7] Methemoglobinemia can be congenital however, In our case, it was dapsone. If a patient's history confirms exposure to an oxidative agent, the patient should be treated immediately to prevent adverse outcomes. Due to the rarity of this condition, it is important for clinicians to recognize the symptoms and offending agents of methemoglobinemia for prompt diagnosis and treatment. Here, we report the diagnosis and management of a patient with dapsone-induced methemoglobinemia with evident cyanosis.

CASE STUDY

A 28year old married female presented to emergency department with history of consumption of 15 tablet of dapsone 100 mg and 15 tablet of clofazimine 50 mg. At emergency Ryles tube inserted and gastric lavage given to the patient and gastric lavage sample send for chemical analysis. After that MLC was done and informed to police on duty. At the time of admission patient vitals was with in normal range. After that patient admitted in female Medicine Ward for observation.

12 Hour after admission patient complaint of breathlessness, palpitation, headache, fatigue. on presentation she was found to have tachypnea with marked central and peripheral cyanosis (figure 1). oxygen saturation on room air was 76 %. She was placed on high flow oxygen by face mask. After giving high flow oxygen patient saturation was not maintained. Arterial blood gases (ABGs) were significant for PH 7.44, pCO2 of 24.5, pO2 of 164, sO2 98.4, HCO3 17.7. Methemoglobin of 32.2 %, Hb 11.4 gm %, WBC 7800, Platelet was 2.61, Sr sodium 139 , Sr potassium 3.0 , Sr Calcium 7.89 . chest x ray showed with in normal limit (figure 2). On ABG analysis, a diagnosis

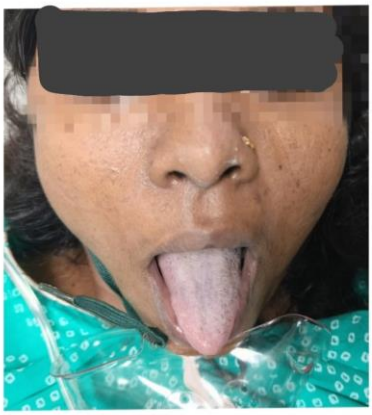

Figure 1- Dapsone induced central and peripheral cyanosis

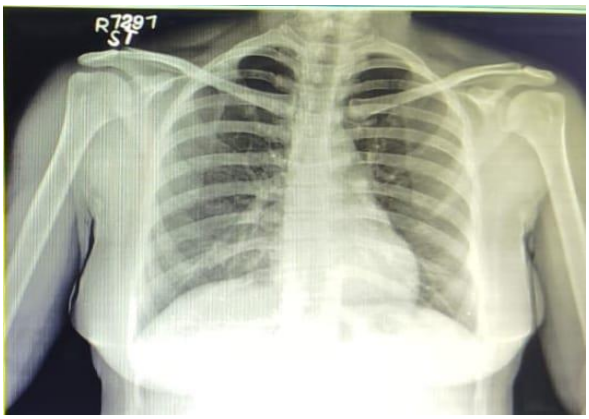

Figure 2- Chest X ray PA view

of Dapsone induced acquired methemoglobinemia was considered. After that patient immediately shifted to intensive care unit for high flow oxygen. She was treated with methylene blue 1 mg /kg intravenously and high dose vitamin C 5 gm intravenously every 6 hour. ABGs were monitored every 12 hourly initially after that 24 hour to trend PO2 and methemoglobin levels (ABG described as bellow in table). Day to day she was continue to shows sing's of improvement progressive improvement with decreasing methemoglobin level and decreasing oxygen requirements. After methemoglobin decrease to normal range patient was shifted to general ward. After shifting psychiatric evaluation of patient and her family member done. After 1week she was discharge without any difficulty and oxygen support. After maintained a close outpatient fallow up with an uneventful recovery.

ABG	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
PH	7.37	7.44	7.40	7.40	7.38
pCO2	26.5	24.5	26.2	26.4	26.8
pO2	121	164	144	178	164
HCO3	17.7	19.3	16.3	21.2	22.4
O2 saturation	98.3	98.4	98.5	97.6	98.6
Methemoglobin	32.2	18.2	12.1	6.8	1.2
G6PD	Not deficient				

DISCUSSION

Dapsone-induced methemoglobinemia, a condition where hemoglobin is oxidized and can't effectively bind oxygen, is a significant concern, particularly in patients taking dapsone for leprosy, acne, or PCP prophylaxis.[8] It can lead to functional anemia and tissue hypoxia, with symptoms ranging from cyanosis to severe complications. Methemoglobinemia occurs when the iron in hemoglobin (normally in the ferrous, Fe2+, state) is oxidized to the ferric state (Fe3+), forming methemoglobin. ver oxygen to tissues. Normally, the body has mechanisms to reduce methemoglobin back to hemoglobin, but dapsone and its metabolites can disrupt this process. Dapsone, a sulfone antibiotic, is a known cause of acquired methemoglobinemia. Dapsone metabolites, particularly hydroxylamine derivatives, induce oxidative stress that leads to the oxidation of hemoglobin.[9] Methemoglobinemia can occur even at standard doses of dapsone, and the risk is higher with prolonged use or higher doses. Dapsone is used for various conditions, including leprosy, acne, and Pneumocystis jirovecii (PCP) prophylaxis. methemoglobin levels in the blood. Arterial blood gas analysis is crucial to assess oxygen saturation and identify the presence of methemoglobin. Initial management focuses on discontinuing dapsone and providing supportive care, including supplemental oxygen. Methylene blue, a drug that can reduce methemoglobin, is often used in cases of severe methemoglobinemia.[7] Other treatments, such as hyperbaric oxygen, exchange transfusions, or activated charcoal, may be considered in some cases.[10] It is important to be aware of the risk of dapsone-induced methemoglobinemia, especially in patients with known or suspected hypoxia, and to consider methemoglobinemia in the differential diagnosis of cyanosis. Dapsone is contraindicated in patients with G6PD deficiency, as methylene blue treatment can worsen hemolysis in these patients.[11] Clinicians should be aware of the potential for dapsone-induced methemoglobinemia and monitor patients for signs and symptoms of the condition. Prompt recognition and treatment are crucial to prevent serious complications.

CONCLUSION

In this case study, dapsone-induced methemoglobinemia was identified as the underlying cause of the patient's symptoms, including cyanosis and hypoxia unresponsive to oxygen therapy. Early recognition of this condition is crucial, as methemoglobinemia can lead to severe tissue hypoxia and life-threatening complications if untreated. Prompt diagnosis was achieved through clinical presentation and laboratory findings, including elevated methemoglobin levels.

The patient responded well to methylene blue therapy, which successfully reduced methemoglobin levels and improved oxygenation. Supportive care and discontinuation of dapsone were also essential in managing the condition. This case highlights the importance of clinician awareness regarding the potential adverse effects of dapsone, particularly in patients at higher risk for methemoglobinemia. Routine monitoring of methemoglobin levels in patients on prolonged dapsone therapy can aid in early detection and prevention of severe complications.

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CONFLICT OF INTEREST
This author declared no conflict of interest.

REFERENCE
1. Ash-Bernal, R., Wise, R. & Wright, S. M. Acquired methemoglobinemia: a retrospective series of 138 cases at 2 teaching hospitals. *Medicine* 83, 265–273 (2004).
2. Mansouri, A. & Lurie, A. A. Concise review: methemoglobinemia. *Am J Hematol* 42, 7–12 (1993).
3. Sangiolo, D. *et al.* Toxicity and efficacy of daily dapsone as Pneumocystis jiroveci prophylaxis after hematopoietic stem cell transplantation: a case-control study. *Biol Blood Marrow Transplant* 11, 521–9 (2005).
4. Mansouri, A. & Lurie, A. A. Concise review: methemoglobinemia. *Am J Hematol* 42, 7–12 (1993).
5. Mansouri, A. & Lurie, A. A. Concise review: methemoglobinemia. *Am J Hematol* 42, 7–12 (1993).
6. Zosel, A., Rychter, K. & Leikin, J. B. Dapsone-induced methemoglobinemia: case report and literature review. *Am J Ther* 14, 585–7 (2007).
7. Ashurst, J. V, Wasson, M. N., Hauger, W. & Fritz, W. T. Pathophysiologic mechanisms, diagnosis, and management of dapsone-induced methemoglobinemia. *J Am Osteopath Assoc* 110, 16–20 (2010).
8. Ash-Bernal, R., Wise, R. & Wright, S. M. Acquired methemoglobinemia: a retrospective series of 138 cases at 2 teaching hospitals. *Medicine* 83, 265–273 (2004).
9. McMillan, D. C., Simson, J. V, Budinsky, R. A. & Jollow, D. J. Dapsone-induced hemolytic anemia: effect of dapsone hydroxylamine on sulfhydryl status, membrane skeletal proteins and morphology of human and rat erythrocytes. *J Pharmacol Exp Ther* 274, 540–7 (1995).
10. Bradberry, S. M. & Vale, J. A. Multiple-dose activated charcoal: a review of relevant clinical studies. *J Toxicol Clin Toxicol* 33, 407–16 (1995).
11. Grossman, S., Budinsky, R. & Jollow, D. Dapsone-induced hemolytic anemia: role of glucose-6-phosphate dehydrogenase in the hemolytic response of rat erythrocytes to N-hydroxydapsone. *J Pharmacol Exp Ther* 273, 870–7 (1995).