Brisk Clinical Response to Erythrocytapheresis in a G6PD-Deficient Patient with Rasburicase-Induced Methemoglobinemia

Laura Cooling MD, MS
Department of Pathology, University of Michigan, Ann Arbor, MI

We read with interest the recent report by Montgomery and Booth, who described a case of methemoglobinemia in a 50-year-old, G6PD-deficient African American man with newly diagnosed T-cell lymphoblastic leukemia being treated with rasburicase for tumor lysis syndrome [1]. Due to ongoing hemolysis and refractory hypoxia, the authors performed a one blood volume erythrocytapheresis with a 45% decrease in methemoglobin (14.6% to 8%). Surprisingly, the patient continued to be hypoxic with subjective dyspnea, bilateral pleural effusions and mildly elevated methemoglobin levels (7.5-11%) for 36 hours post-exchange. We would like to share our experience in a nearly identical patient several years ago, in whom we observed an immediate improvement in symptoms following erythrocytapheresis.

The patient was a 64 kg, 15-year-old African-American male with a 2-week history of fever, Bell’s palsy, lymphadenopathy, nausea, and abdominal pain due to new T-cell lymphoblastic leukemia. His initial laboratories showed a mildly elevated WBC count (11.6 K/µL, range 13.7-17) with 40% circulating blasts, anemia (hemoglobin 11.4 gm/dL), elevated lactate dehydrogenase ([LDH] 8375 IU/L, range 120 – 240 IU/L), hyperuricemia (29.5 mg/dL, range 3.5 – 7.8), and acute renal failure (creatinine 4.8 mg/dL, range, 8-20). While in the emergency room, he received 6 mg rasburicase for tumor lysis syndrome. Within 3 hours of receiving rasburicase, he became hypoxic with O₂ saturation 70-80% despite escalating O₂ supplementation, accompanied by falling hemoglobin and methemoglobinemia (16%, range 0-1.5%). The patient was transfused 1 unit RBC and given a 25% test dose of methylene blue with...
no clinical improvement, worsening anemia, tachypnea (21-27 breaths/min) and ongoing methemoglobinemia. Within 12 hours of admission, the patient required intubation with O\textsubscript{2} saturations=60% on 100% FiO\textsubscript{2}, methemoglobin=23%, lactate=5 mmol/L (range, 0.4-2.2), hemoglobin=7.9 gm/dL, LDH=12699 IU/L and acidosis (pH=7.2). The patient subsequently underwent emergent erythrocytapheresis for methemoglobinemia and presumed G6PD-deficiency. The procedure was performed on a COBE Spectra at a whole blood: anticoagulant ratio of 7:1, 30% fraction cell remaining, an end hematocrit of 30% and 8 units group O RBC (2693 mL) for replacement. The patient had a brisk clinical response to erythrocytapheresis with O\textsubscript{2} saturations >90% by the end of the procedure. He was extubated approximately 4 hours post-procedure with a methemoglobin=5% and O\textsubscript{2} saturation=95% on 2L supplemental oxygen. By day 3, the patient had normal O\textsubscript{2} saturation on room air and a methemoglobin=2.3%. Subsequent testing confirmed that the patient was G6PD-deficient.

This is the fifth report of refractory methemoglobinemia treated by either whole-blood exchange or erythrocytapheresis [1-4], and the third case following rasburicase administration in G6PD-deficient patients [1,2]. Like carbon monoxide poisoning, methemoglobinemia causes a left-shift in the O\textsubscript{2} dissociation curve, leading to a progressive and refractory hypoxia that is exacerbated and amplified in the setting of anemia [5]. Patients with symptomatic methemoglobinemia are typically treated with supplement oxygen, RBC transfusion and methylene blue, which helps restore glutathione levels. In G6PD-deficient patients, however, methylene blue can independently precipitate hemolysis and methemoglobinemia. This case shows a prompt improvement in oxygenation with erythrocytapheresis in the setting of methemoglobinemia and G6PD-deficiency [2,4], in whom methylene blue is contra-indicated.

REFERENCES:


