Case Report

Rare Case of AKI in Patient with G6PD Deficiency

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ABSTRACT

Nitrobenzene compound poisoning with methaemoglobinemia is successfully treated with Methylene blue injection. This is case report of patient of nitrobenzene compound poisoning who deteriorated after methylene blue injection. The reason for this deterioration was acute kidney injury caused by massive intravascular hemolysis in G-6-P.D. deficient state. Thus if G6PD deficiency state is ruled out before methylene blue administration, then we can avoid serious complications, like acute kidney injury in these patients.

Introduction :

Sofar there are many case reports of Nitrobenzene compound poisoning with methaemoglobinemia, which were successfully treated with Methylene blue injection. This is first case report of deterioration of patient after methylene blue injection. This occurred because of acute hemolytic anemia and acute renal failure induced by methylene blue. The reason for this effect of methylene blue was familial G6PD deficient state in our patient.

Case report :

This is a case of 34 years old male, who was admitted to GMC ICCU with history of alleged consumption of insecticide Bloom flower (Nitrobenzene compound 35% w/v.) Patient had vomited once after consumption of the insecticide. On admission patient was conscious, irritable, responding to verbal commands. He was afebrile, pulse was 90 / min., regular, respiratory rate was 18/min., thoracoabdominal, SpO2 of 83% and there was deep central cyanosis. On systemic examination chest was clear and heart sounds were normal. Immediately oxygen was administered with high flow oxygen mask, but there was no change in cyanosis. The laboratory investigation revealed normal complete blood count with hemoglobin of 14.2 gm% and normal blood urea (35mg/dl) and serum creatinine (0.9 mg/dl). The blood drawn for blood gas analysis was dark brown colored. Areterial blood gas analysis revealed normal oxygen saturation with metabolic acidosis with respiratory compensation. Gastric lavage was done through Ryle's tube. In view of central cyanosis without any cardiopulmonary disease and with normal oxygen saturation and alleged history of Nitrobenzene compound, methaemoglobinemia was suspected and methhemoglobin level was estimated. Meth-hemoglobin level was 16.8% (normally < 1.5%). Thus diagnosis of Nitrobenzene poisoning with methaemoglobinemia was considered. The drug of choice for Nitrobenzene compound induced methaemoglobinemia is Methylene blue. Patient was treated with lnj. Methylene blue 1% solution 50 mg IV over 5 min and then 2 more doses administered 1 hour apart with tablet Vitamin C 500 mg in BID doses. Thiamine was also started. Following administration of Methylene blue, patient developed dark colored urine. Initially it was thought to be posttraumatic and attributed to accidental traction of Foley's catheter. On urine examination, urine was dark brown coloured, albumin +++ and Blood ++; no bile salts and pigments or red blood cells were seen, but hemoglobinuria was confirmed. Blood smear and hemoglobin electrophoresis were normal. Coomb's test was negative. There was drop in hemoglobin from 14.2 gm% to 5.3 gm%. Patient's general condition deteriorated, he became comatose. He was administered with additional dose of Inj Methylene blue. Following this Urine output was decreased and hemoglobinuria persisted. Blood urea increased to 274 mg/dl, and creatinine was 11.1 mg/dl. Peritoneal dialysis was started. Hemoglobinuria still continued. Thus the clinical scenario was of acute

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hemolytic anemia secondary to Methylene Blue administration hence G6PD deficiency was suspected. Laboratory report reveled G6PD deficient state. He was transfused with 1 unit of whole blood and supportive management was continued. There after patient started improving, urine output increased. Kidney functions got normalized. He was discharged on 14th day of hospitalization in stable condition. He was case of Familial G6PD deficiency with Nitrobenzene compound poisoning with Methylene blue induced acute hemolyticanemia with acute renal failure. The clues for diagnosis were history of ingestion of Nitrobenzene compound, Low SpO2, dark brown colouredblood; increased methaemoglobin level in blood, Methylene blue induced hemolyticanemia and G6PD deficient state.

Discussion :

Nitrobenzene is an organic compound with the chemical formula $C_6H_sNO_2$. It is water insoluble pale yellow oil with an almond like odour.[4] It freezes to give greenish yellow crystals. It is produced on a large scale from benzene as a precursor to aniline. Approximately 97% of nitrobenzene is used in the production of aniline, which is a precursor to rubber chemicals, pesticides, dyes (particularly azo dyes), explosive, and pharmaceuticals. The first report of nitrobenzene poisoning came in 1886 and subsequently other reports followed.[1] Nitrobenzene compound intoxication can be accidental or suicidal.[2] The toxic effects after ingestion are due to the rapid development of methaemoglobinemia.

Methaemoglobinemia is a condition in which the ferrous (Fe+++) state of iron within haemoglobin gets oxidized to Ferric (Fe++) state, which results in the inability of oxygen transport and dark chocolate brown discoloration of blood.[4] Normal level of methemoglobin is 0 to 2% and acute intoxication shows 10 to 15% methemoglobin which is usually asymptomatic sometimes with only cyanosis.[1] Beyond 20% headache, dyspnea, chest pain, tachypnea, and tachycardia develops and above 40% confusion, lethargy, and metabolic acidosis leading to coma, seizures, bradycardia, ventricular dysarrythmia, and hypertension. More than 70% is highly fatal and leads of death.[2,4]

Antidote of choice for acquired (toxic) methaemoglobinemia is methylene blue, 1-2 mg / kg administered as a 1% solution undiluted as direct IV over 3-5 minutes, repeated at 1 mg / kg in 1 hour as necessary to control fluctuating symptoms.[1] Methylene blue is an exogenous cofactor that donates electron which rapidly reduces methemoglobin to ferrous state through NADPH (nicotineamide adenine dinucleotide phosphate) dependent methemoglobinreductase system.[3] Methylene blue is contraindicated in patients with G6PD (glucose 6 phosphate dehydrogenase) deficiency leading to severe hemolysis and it can swap its action causing methemoglobinemia at higher doses.[1]

Adjuvant treatment includes ascorbic acid an antioxidant, plus free radical scavenger which reduces the NAD at dose of 0.5 - 1 gm given 8 hourly. There is very less evidence from recent studies that suggested N-acetyl cysteine is effective in reversing methemoglobin. RBC exchange transfusion and hyperbaric oxygen therapy are usually reserved for patients who are resistant to standard treatment and for those with severe symptoms.[1] Dextrose should be administered as it's the major source of NADH in the erythrocyte which catabolizes sugar through glycolysis and also a source of NADPH through the hexosemonophosphate shunt, which is necessary for enhanced effectiveness of methylene blue.[1]

Acute renal failure is an uncommon complication in G6PD deficiency. Renal dysfunction occurs mainly due to acute tubular necrosis and tubulointerstitial nephritis. If G6PD deficiency state is rule out before methylene blue administration, then we can avoid serious complications, like acute kidney failure. Hence methylene blue should be used with caution by only after ruling out G6PD deficiency.

References :

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