Case Report

BLUE DEATH: A Rare Case of Copper Sulphate Poisoning

Rishit Anand[1], Jagadish Rao P P[2], Cheryl Philips[3]

Abstract

Background: Copper Sulphate is an easily available chemical, and its crystals are often used for elementary experiments in schools and colleges, however, ingestion of these crystals is exceedingly rare. The lethal dose is around 10 grams causing severe injury by intravascular haemolysis, methemoglobinemia, acute kidney injury and rhabdomyolysis. Thus, if ingested in lethal dose, has a poor prognosis with high fatality rate. *Case Report:* A male aged 36 years, suffering from depression consumed an unknown amount of copper sulphate crystals in attempt to suicide and succumbed to death within 24 hours of consumption. A Post-Mortem examination was carried out and portion of liver and kidney were sent for histopathological examination which showed microvesicular and macrovesicular steatosis while kidney shows features of acute kidney injury. Based on the findings, the probable cause of death was complications of copper sulphate compound poisoning. *Conclusion:* Due to high mortality in case of this chemical compound, it is essential that clinicians should be familiar with its detection and treatment. We report a rare case of suicide by ingestion of unknown quantity of copper sulphate which led to death within 24 hours of consumption. Hepatic Steatosis and Acute Kidney Injury were reported in the present case.

Keywords: CuSO4 Poisoning, Hepatic steatosis, Acute Kidney Injury

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Introduction:

Copper Sulphate is an easily available chemical, and its crystals are often used for elementary experiments in schools and colleges, however, ingestion of these crystals is exceedingly rare. It also has agricultural and industrial uses. Being an extremely good oxidizing agent, it has potential to cause serious cellular damage depending on the dose ingested- primarily affecting RBCs, kidneys, GIT and CVS.[1] The lethal dose is around 10 grams causing severe injury by intravascular haemolysis, methemoglobinemia, acute kidney injury and rhabdomyolysis.[2] Thus, if ingested in lethal dose, has a poor prognosis with high fatality rate. Copper Sulphate Pentahydrate is thus, a potential but rare chemical reported in poisoning or suicide cases.

[1] MBBS student, [2] Professor & Head, Department of Forensic Medicine and Toxicology, Kasturba Medical College Mangalore, Manipal Academy of Higher Education, Karnataka, Manipal, 576 104, India, [3]Associate Professor Department of Pathology, Kasturba Medical College Mangalore, Manipal Academy of Higher Education, Karnataka, Manipal, 576 104, India
Correspondence: Dr. Jagadish Rao PP
Email: ppj.rao@manipal.edu
Contact: +919900405085

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Case report:

A male aged 36 years, suffering from depression from last seven years consumed an unknown amount of copper sulphate crystals at his residence in attempt to suicide. He was shifted to a tertiary care government hospital where he succumbed to death within

24 hours of consumption. A Post-Mortem examination was carried out. Toxicology studies revealed copper and sulphate ions and ethyl alcohol in routine viscera. Both the lungs parenchyma was congested and oedematous on cut-section. Diffuse submucosal haemorrhages were also seen. Liver and Kidney parenchyma were pale in cut-section. Portion of liver and kidney were sent for histopathological examination. Histopathological examination of liver showed microvesicular and macrovesicular steatosis while kidney shows features of acute kidney injury as depicted in Figure 1 and 2. Based on the autopsy findings, histopathological and chemical examinations, the probable cause of death in this case were complications that arose from copper sulphate compound poisoning.

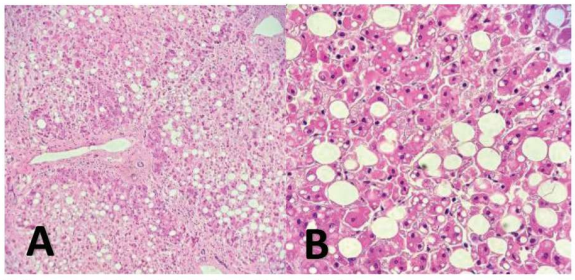

Figure 1: A) & B) - Liver parenchyma showing Micro vesicular and macro vesicular steatosis

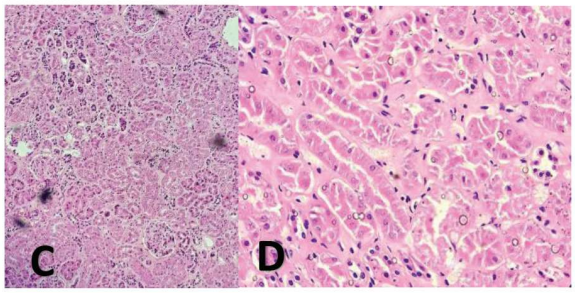

Figure 2: C) & D) - Renal parenchyma showing features of acute kidney injury

Discussion:

Copper poisoning is a rare mode of suicide.[3] According to a case report by Andreja Sinkovic et al, even ingestion of one gram of copper sulphate is enough for manifestation of symptoms of toxicity but it also depends on individual factors. Mortality in cases of severe poisoning is high, and the lethal dose of ingested copper sulphate is between 10-20 g.[4] Common gastrointestinal manifestations such as mucosal and submucosal bleeds occur due to corrosive nature of copper causing and the oxidising property of the compound is responsible for cellular damage. Liver is one of the first organs to get affected as copper gets deposited in the liver via portal circulation resulting in acute liver failure following tissue necrosis.[5]

Two major haematological manifestations of copper sulphate poisoning are intravascular haemolysis and methaemoglobinaemia.[6] Intravascular haemolysis is due to direct oxidative damage to erythrocyte membranes and copper ions oxidise ferrous ion of haemoglobin to ferric ion which manifests as methemoglobinemia resulting in cyanosis and loss of oxygen carrying capacity of blood. Usually 14-36% of the patients die within a few hours of ingestion, while the average hospitalization time in those who survive is more than 20 days.[7] Acute kidney injury is a much commoner manifestation of toxicity with some case reports having an incidence as high as 40-60%.[8] Though the poisoning is rare in nature but due to potential lethality, early detection and management is crucial for better outcome. Antidotes such as methylene blue for methemoglobinemia and chelating agent such as DMPS improve morbidity and survival of severely poisoned victims.[9]

Conclusion:

Cooper Sulphate is commonly used chemical and readily available, but its ingestion and poisoning is a rare occurrence. Due to high mortality in case of this chemical compound, it is essential that clinicians should be familiar with its detection and treatment. We

report a rare case of suicide by ingestion of unknown quantity of copper sulphate which led to death within 24 hours of consumption. Hepatic Steatosis and Acute Kidney Injury were reported in the present case.

References:

1. Gupta, D., Kerai, S., & Budoo, M. S. A fatal and deceiving case of copper sulphate poisoning. *Indian journal of anaesthesia*, (2018) *62*(10), 819–820.
2. Gamakaranage, C. S., Rodrigo, C., Weerasinghe, S., Gnanathasan, A., Puvanaraj, V., & Fernando, H.Complications and management of acute copper sulphate poisoning; a case discussion. *Journal of occupational medicine and toxicology (London, England)*, (2011) *6*(1), 34.
3. Franchitto, N., Gandia-Mailly, P., Georges, B., Galinier, A., Telmon, N., Ducassé, J. L., & Rougé, D. Acute copper sulphate poisoning: a case report and literature review. *Resuscitation*, (2008) (1), 92–96.
4. Metals and Related Compounds. Edited by: Ellenhorn MJ. Maryland: Williams and Wilkins; 2 1997:.
5. Jantsch W, Kulig K, Rumack BH: Massive copper sulfate ingestion resulting in hepatotoxicity. J Toxicol Clin Toxicol 1985, 22:585-588.
6. Saravu K, Jose J, Bhat MN, Jimmy B, Shastry B: Acute ingestion of copper sulphate: A review on its clinical manifestations and management. Indian J Crit Care Med 2007, 11:74-80.
7. Nastoulis, E., Karakasi, M. V., Couvaris, C. M., Kapetanakis, S., Fiska, A., & Pavlidis, P.Greenish-blue gastric content: Literature review and case report on acute copper sulphate poisoning. *Forensic science review*, (2017) 2*9*(1), 77–91.
8. Chugh KS, Sharma BK, Singhal PC, Das KC, Datta BN: Acute renal failure following copper sulphate intoxication. Postgrad Med J 1977, 53:18-23.
9. Sinkovic, A., Strdin, A., & Svensek, F. Severe acute copper sulphate poisoning: a case report. *Arhiv za higijenu rada i toksikologiju*, (2008) 59(1), 31–35.