Case Report

Intentional Self Harm by Formalin Ingestion

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Abstract:
Formalin is a protoplasmic poison and causes coagulation necrosis, protein precipitation, and tissue fixation. Formaldehyde has wide commercial and medical applications. Its used in its many forms in the health care industry as a tissue preservative of specimens and as a embalming fluid for bodies and even as a disinfectant. Suicidal ingestion of formalin is an uncommon occurrence as the general public is unknown to the compound and its availability is a difficult task as compared to insecticides and rodenticides. Here we present such a rare occurrence of formaldehyde ingestion and subsequent death.
Keywords: Formalin; tissue preservative; embalming fluid; Suicide

Introduction:

Formalin is an aqueous solution of formaldehyde containing 37-40% formaldehyde and 10-15% methanol. It is, however, generally referred to as 100% formalin. The commercial preparation usually contains 3.7% of formalin. Formalin is a protoplasmic poison and causes coagulation necrosis, protein precipitation, and tissue fixation. Such fluids are used for embalming and also for preparation of pathologic tissue specimen. Formaldehyde is also used as an ingredient in fertilizers, biocides, antimicrobial hair shampoos and conditioners, industrial and soil sterilants etc. Ingestion of formalin leads to coagulative necrosis of the esophagus, and particularly the stomach, to produce tanned leather like appearance of mucosal surfaces.[1] The ingestion of formalin causes discernible loss of architecture of the normal mucosa in the entire gastrointestinal tract, liver, kidneys, lungs, heart and the central nervous system in the early phase of reaction. Formaldehyde reacts rapidly with DNA, RNA, and proteins in biologic systems. When cells are exposed to high concentrations, cellular functions cease and necrosis is rapid. Formaldehyde may affect neural functions by condensing non-enzymatically with neuroamines, catecholamines and indamines to form tetrahydroisoquinolines and tetrahydrobetacarbolines respectively.[2]There are very few documented and investigated cases of death due to formalin ingestion which are available in forensic literature. Suicidal ingestion of formalin is an uncommon occurrence as the general public is unused to the compound and its availability is a difficult task as compared to insecticides and rodenticides. Here we present such a rare occurrence of formaldehyde ingestion and subsequent death.

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Dead body of 25 year old female was brought to Kasturba Medical College mortuary Manipal with a history of dowry harassment. The information given by the police revealed that the deceased was found dead at her residence.

On external examination the body was that of an adult female, moderately built and poorly

nourished. On internal examination, the mucosa of the esophagus was thickened and firm having a pipe like consistency. The stomach was perforated at the greater curvature and mucosa was dark brownish black in colour. Mucosa of the small intestine was found to be brownish black in colour. Peritoneal cavity contained dark brownish black colored fluid. Surface of the liver, spleen, and kidney was discolored due to contact with spilled contents of the stomach. No appreciable external injuries were present. Blood and viscera were sent for chemical analysis to regional forensic science laboratory, Mangalore which revealed the presence of formalin. The cause of death was opined to be due to chemical peritonitis following consumption of formalin containing compound.

Discussion:

Formaldehyde is a highly reactive substance; it may be irritating to the eyes, skin, and mucous membranes. Ingestion may cause corrosive injury to the gastrointestinal mucosa and the mucous membranes of the respiratory tract.[3]

The formalin induced corrosive damage of the gastrointestinal tract depends upon the duration of contact between formalin and gastrointestinal tract. Esophageal burns with formalin are rare because of the rapid passage through esophagus.[4] It has been documented in a case that there was the presence of a normal mucosa in the esophagus with a charring of the gastric mucosa and subsequent gastric outlet obstruction as evident on endoscopy.[5] If present it may be probably due to ingestion of high concentration, large amounts and persistent vomiting which exposes the esophagus to formalin repeatedly.[6] The stomach suffers the most severe damage in such cases because formalin is in contact with the gastric mucosa longer than other parts of gastrointestinal tract. Corrosive injuries are most pronounced in the pharyngeal mucosa, epiglottis and esophagus. The heart may undergo fibrosis. This will cause cardiac insufficiency. The lung may become fibrosed, resulting in respiratory insufficiency.[7]The phenomenon of perimortal fixation is a useful indication for the forensic pathologist and should direct the suspicion to oral poisoning. The detection of fixation facilitates toxicology screening by indicating that the relevant substance must have the capability to precipitate proteins. The "fixing" of the stomach by formaldehyde may produce delayed absorption following formalin ingestion.[8]

Conclusion:

Formalin is an uncommon poison to be ingested in suicidal attempt due to its disagreeable taste and odour and also due to difficulty in availability. Ingestion of formalin in significant amount has fatal consequences. Cause of death may be multifactorial due to its effect on various organs. People should be aware of the adverse effect of this solution to the living tissue. Poisoning by ingestion of formalin is lethal and must be treated at an early stage. The prognosis is linked to the extent of caustic injuries and of systemic effect. Meticulous dissection and the proper preservation of the viscera help in identifying the cause of death.

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