Case Report
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Unusual brain, liver and uterus findings in a case of HCl acid ingestion: A case report

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Abstract

There are often cases reported in the hospitals with the alleged history of corrosive ingestion. Many of the times, the victims succumb to death due to the corrosives induced injuries. On autopsy examination, the effects produced by the corrosive ingestion do not remain confined to local contact areas in gastrointestinal tract but are also observed in the distant organs. In this particular case some of the unusual findings in liver, brain and uterus apart from the usual findings were observed. This case report discusses about the possible reasons and pathophysiological mechanism behind these unusual findings.

Keywords: HCl, ingestion, corrosive, extravasation, hematoma, nutmeg, liver

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1. Introduction

Corrosive chemicals are widely used both in industry and the home. A corrosive substance is one that destroys or irreversibly damages another surface or substance with which it comes into contact with. The often exposed parts of the body to such corrosives are eyes, skin and mucus membrane leading to chemical burns and sometimes damages the surfaces to the extent of perforation.

The chemical compound, hydrochloric acid [HCl] is the aqueous (water-based) solution of hydrogen chloride gas. It rapidly dissociates and its effects are thought to be a result of pH change (local deposition of H+) rather than effects of hydrogen chloride/hydrochloric acid. The hydrogen chloride molecule [HCl] is a simple diatomic molecule consisting of a hydrogen atom H and a chlorine atom [Cl] connected with a polar covalent single bond. It is highly corrosive acid, which means it immediately causes severe damage, such as burning, on contact. The fatal dose is about 15 -20 ml and fatal period is about 18-36 hours [1].

2. Case Report

A 26 years old woman died due to ingestion of toilet cleaner-hydrochloric acid (HCl) for an unknown quantity within 24 hours of alleged intake. She was married for two and half years and was diagnosed as a case of Depressive psychosis for the last two and half years. She was under treatment and taking antidepressants for this. The police recovered a 500 ml empty bottle with a label of concentrated HCl acid over it from alleged scene of occurrence. On autopsy along with the usual findings of acid poisoning like corrosion of mucosa of lower lip, bleaching of oral mucosa and corrosion of tongue blackened sternum, brownish black peritoneal fluid, perforation of stomach and intestine along with corrosion, some unusual findings like nutmeg appearance of liver with the blackish discoloration of left lobe (Fig:1), extravasations of blood in uterine wall (Fig:2), and bilateral diffuse circumscribed subdural hematoma over both occipital lobes ,not reported earlier in the literature were also seen(Fig:3).

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The toxicology lab report confirmed the presence of HCl in empty bottle, blood and viscera samples. In this case report role of hydrochloric acid(HCl) has been discussed as a cause of these unusual findings.



Figure 1. Blackening of left lobe and nutmeg appearance of liver.



Figure 2. Extravasation of blood in Uterine wall.

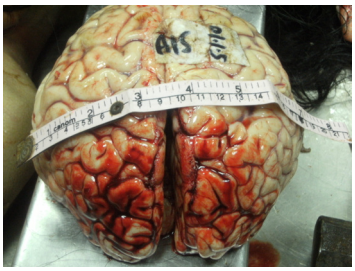


Figure 3. Diffuse bilateral circumscribed subdural hematoma over occipital lobes.

3. Pathophysiology

Pharmacokinetic studies with HCl have not been conducted, but hydrogen and chloride ions are involved in normal physiological processes.HCl dissociates in water to form hydronium ions (H_30^+) that can interact with tissue elements, resulting in cell injury or death. Henderson and Haggard (1943) summarized information from several sources related to how long various exposure concentrations of HCl could be tolerated by healthy workers and what effects might occur. Acids lead to coagulation necrosis resulting in the formation of an eschar which prevents further injuries. Vascular thrombosis may further aggravate tissue injuries leading to sloughing of superficial layers. Though HCl is a natural constituent of fluid of stomach and bowels and is less corrosive in action than H_2SO_4. It does not usually corrode or seriously damage the skin but it readily destroys mucous membrane. The mucous membrane is at first grey or grey white and later on becomes brown or black due to production of acid haematin and this may be the reason behind the blackish discoloration of left lobe of liver in this case.

Postmortem findings are dependent upon the quality and strength of acid used and the time that patient survives after taking the acid used. Usually the postmortem findings are limited to upper digestive tract and the respiratory system caused by inflammation, swelling, severe interstitial hemorrhage and even corrosion and perforation leading to peritoneal fluid, chemical peritonitis and corrosion of organs. Secondary toxic swelling of liver and kidney is seen if person survives longer.

The acid ingestion is fatal in nature and those persons who survive for sometimes get multiple predictable findings however in this case certain unpredictable/ unusual findings are also reported in liver, brain and uterus. Their action on living tissue is based on acid-base catalysis of ester and amide hydrolysis. Corrosive acids are able to catalyze the hydrolysis of fats, which are chemically esters. Proteins are chemically amides, which can also be hydrolyzed by acid-base catalysis and denature proteins and also hydrate easily. Hydration removes water from the tissue and is significantly exothermic. These effects may bring about damage to different tissues of the body.

4. Discussion

A nutmeg liver appearance is due to a perfusion abnormality of the liver usually as a result of hepatic venous congestion. [2] In this case it may be because of distant effect on vascularity of liver due to absorbed HCl or due to effect of antidepressant drugs being consumed by her for last 2.5 years. All antidepressants can induce hepatotoxicity. The interval between treatment initiation and onset of liver injury is generally between several days to 6 months. [3] There was no history of trauma to abdomen and no other associated injury was seen on

abdominal wall. Also she was in nonmenstrual phase and the changes were observed in all the layers of uterus, so there is likelihood of possibility of acid induced damage to the blood vessels leading to extravasation of blood in the walls of the uterus. As far as the findings of brain are concerned, considering the fact that there was no history of trauma and no associated injury was seen in overlying scalp or cranium and the changes were not resembling with the postmortem hypostasis. The blood was extravassated and circumscribed in the form of subdural hematoma so there is likelihood of acid induced vascular changes in occipital region of the brain.

When a strong acid comes into contact with the internal tissues, it causes coagulation necrosis, tissue disintegration and/or ulceration of tissues. It also causes thrombosis of vessels. [4] Acid ingestion kills a person rapidly, producing many predictable injuries as well as postmortem artefacts [5]. Measuring the pH and concentrations of various ions in body fluids and contents of the alimentary tract enabled postmortem diffusion of HCl is helpful to determine it's effect on the various tissues. [6] Wedge-shaped low densities can be seen in the liver on CT scans after ingestion of glacial acetic acid. They may represent hepatic necrosis caused by the direct effect of toxic materials absorbed into portal circulation[7], noninflammatory peri-portal liver necrosis after acetic acid ingestion results from a direct effect of noxious agents on hepatocytes[8]. The commonest age group of victim was between 21 to 30 years and predominance of males in 63% cases with manner of death as suicidal (81%) in most of the cases with maximum mortality (56%) was observed with in first 24 hours of hospitalization after ingestion [9]. Suicide by consumption of corrosive is more common in psychotic persons [10].

5. Conclusion

Corrosives are different from poisons in that corrosives are immediately dangerous to the tissues they come in to contact with, whereas poisons may have systemic toxic effects that require time to become evident. In this case the acid has produced local as well as distant findings. Some of the distant findings on liver, brain and uterus were unusual and have not been reported earlier. It is a matter of discussion whether these changes are because of the acid or some other reasons. This may indicate effect of acid on the blood vessels after getting absorbed from the GIT, leading to nutmeg appearance of liver, circumscribed subdural hematoma around occipital lobes and extravasation of blood in uterus and may be the reason of mortality in this particular case. It is a matter of further research to find out the different kind of interactions between blood vessels of these particular organs with the constituents of concenterated HCl acid for better understanding of reasons and pathophysiological mechanism behind these unusual findings.

6. Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical statement: All necessary ethical approval has been taken before the study

Conflict of Interest: None Declared

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