

BRIEF RESEARCH

An Unconventional Method of Suicide by Corrosive Ingestion vis-à-vis Medicolegal Aspects – Autopsy based Brief Research

Kaushik R,¹ Jakhar JK,² Dahiya S.³

Resident,¹ Professor,² Senior Resident.³

1-3. Department of Forensic Medicine, Pt. B. D. Sharma PGIMS Rohtak.

Abstract:

Defining the word suicide is just misconstruing the gravity, essence and biology behind the mood, thought and behaviour of developing it. Suicide is not an act but a complex behaviour. As per literal meaning, it is just killing of oneself by himself. The method of suicide chosen by the victim depends on their availability of method and intensity of impending impulse of suicide. The authors here are discussing various autopsy cases of fatal ingestion of corrosives. The autopsy findings over the body, proper history and pattern-distribution of injuries over the body are correlated to each other to know the cause and manner of death. The injuries sustained over the gastrointestinal tract due to corrosive ingestion are compared with the findings observed by the authors in different cases. The legal aspect of the acid related injuries are also discussed. This method of suicide by corrosive ingestion is quite rare. The clinical symptoms, investigative observation and treatment outcome varies widely with case to case depending upon the patient profile, tissue affected and concentration of corrosive. However, detailed history taking, psychological profile of patient and medical expert's eye can diagnose the case on time which can save the patient with better prognosis.

Keywords: Corrosive poisoning; Suicide; Autopsy; Vitriolage; Caustics.

Introduction:

Corrosives (strong acid and alkali) are substances that have a corroding and destructive effect on the human body. They are almost exclusively local acting and have very few systemic effects with the exception of generalised shock. Acids like sulphuric, nitric, hydrochloric etc. are potent desiccants with the ability to produce a coagulation necrosis and eschar formation of injured tissue. The extent and severity of chemical injury to the GIT depends upon the corrosive nature of the ingested substance, the quantity, concentration of the ingested substance and duration of contact.¹ Aqua regia (from Latin, literally "regal water" or "royal water") is a mixture of nitric acid and hydrochloric acid, optimally in a molar ratio of 1:3. It was named by alchemists because it can dissolve the noble metals like gold and platinum, though not all metals. It is used by the gold smith in diluted form to glisten the old ornaments made up of gold, silver and platinum due to its corrosive nature.² All caustics (The term caustic is often mistakenly presumed to denote an alkali, while actually it has a much broader meaning and refers to any substance which is corrosive and burning in nature. Obviously, this would include apart from alkalis, the more important group comprising acids both inorganic and organic) are highly injurious locally and produce burns of varying severity and intensity. Three phases of

corrosive-tissue interaction have been recognised as Acute inflammatory phase, latent granulation phase and chronic cicatrization phase.³ Keeping the physical and chemical actions of the corrosive aside, this method of choice of suicide using acid ingestion is obviously unconventional and there must be enough factors to precipitate that leads one to ingest any corrosive. Not only that, the availability of acid restricted and scrutinised by the statute under the Corrosive And Explosive Substances and Offensive Weapons Act 1958. However, the acid though in the diluted form are still available for domestic purpose and in the concentrated form for the industrial use.

We are presenting herewith a case series of suicide by corrosive ingestion, discussing rarity of this mode of suicide, factors influencing the mode of suicide and legal issues concerning suicide in mental illness.

Case Studies:

Case no. 1- An 18-year-old, unmarried male gold smith was brought to psychiatry outpatient department of hospital by his relatives. The patient had strong ideas of suicide and had made repeated attempts of suicide. On further enquiry he was found to have symptoms of sadness, easy fatigability, lack of concentration, sleeplessness, lack of appetite, loss of interest in work and daily activities of three weeks duration. Physical examination was unremarkable. Thus, on clinical evaluation a diagnosis of severe Major Depressive Disorder was made. During his follow-up days, he was brought to the emergency with pungent odour emanating from the patient. Patient became increasingly restless and was clutching his upper abdomen. On enquiry he complained of burning pain in the chest and upper abdomen. After history and general examination, a tentative

Corresponding Author

Dr. Jitender Kumar Jakhar

Email : jjakhar2008@gmail.com

Mobile No.: +91 94164 76754

Article History

DOR : 30.08.2023; DOA : 12.02.2024

diagnosis of acid poisoning was made. As the patient developed difficulty in breathing and became semiconscious, he was put on assisted breathing. The patient's condition gradually deteriorated and he died after 2 hours. The autopsy was performed 6 hours after the death. At autopsy, blackish discoloration of dorsal aspect of great toes and second toes of both feet eroding the nails with puckering of edges of the wound suggestive of corrosive acid burn (Fig. 1). They were due to the spillage of the ingested corrosive. Tongue was found swollen. The mucosa of esophagus was blackish discolored. The stomach contained about 30 cc of brownish mucoid material. Mucosa was thinned out with loss of rugosities and multiple erosions with base of ulcers greenish discolored (Fig. 5). The mucosa was deeply congested and



Figure 1. Showing yellowish discoloration of mucosa due to xanthoproteic reaction after ingestion of nitric acid.



Figure 2. Showing localised oedema of base of tongue and oropharyngeal structures conforming the mode of intake i.e., ingestion of irritant substance not the inhalation.



Figure 3 & 4. Showing burns over the feet due to spillage effect of the corrosive ingested.

haemorrhagic. All other internal organs were intact and congested. The stomach, loops of intestine, portion of liver with gall bladder, half of each kidney and spleen were preserved in rectified spirit and sent for toxicological analysis along with blood sample. The chemical examiners report was positive for hydrochloric acid and Nitric Acid in the viscera.

Case no. 2 - We received a dead body of a male individual in the mortuary for medicolegal autopsy. On examination, the shirt was found bleached and decolorized from the right upper aspect. On further examination, Lips showed brownish discoloration at places. Base of tongue, pharynx and esophagus showed congestion, swollen and blackish discoloration over mucosal layer. (Figure 2). Larynx and trachea showed congestion. On



Figure 5. Showing gastric ulcers with greenish base due to localised effect of sulfuric acid ingestion.



Figure 6. Velvety congestion of gastric mucosa after corrosive ingestion.

dissection of abdomen, the peritoneal cavity was blackish discoloured and a perforation of size 1 x 1 cm was present over the anterior aspect of the upper part of the body of stomach along the lesser curvature. The whole stomach was pulpy and blackish in color. Mucosa was deeply congested and hemorrhagic with blackish discoloration at places. The viscera were preserved for detection of corrosive and the report came positive for hydrochloric acid. The opinion as to the cause of death was given as stomach perforation and its complications due to acid ingestion.

Case no. 3- An old aged female was brought to the casualty with alleged history of assault under unknown circumstances. Patient was stabilized with initial resuscitative measures and was medicolegally examined and multiple blunt force injuries along

with some burn injuries were noted. She succumbed to death within 3 hours of admission and the body was brought to the mortuary for medicolegal autopsy. After taking detailed history and initial external examination, the deceased was 84 years old female, a follow up patient of chronic insomnia and was on drug alprazolam. On external examination, the clothes worn by the deceased were brownish stained.

Chemical burns over an area of size 53 × 42 cm were present involving the anterior aspect of lower part of left side of chest including left breast, anterolateral aspect of left side of abdominal wall, lateral aspect of left gluteal region and upper part of left thigh. Burns were blackish with reddish discoloration at places and leathery touch. It was muscle deep at places under anterior aspect of abdominal wall. Superficial chemical burns were also present over the top of bilateral shoulder region, chin, focally at anterior aspect of neck and chest region more so over the left side suggestive of spillage burns. Reddish abrasions were present over the anterior aspect of right knee joint, medial aspect of left knee joint, anterior aspect of left leg, anterior aspect of left leg, medial malleolus of right ankle joint. Lips and tongue were blackish and eroded. Mucosa of the oral cavity including hard palate was blackish and eroded. Mucosa of the esophagus was blackish and eroded all over the length. Stomach contained about 50 cc of blackish mucoid material. Mucosa was eroded. Preserved for chemical analysis along with its contents the report came positive for sulfuric acid. The cause of death was given as corrosive acid burn and its complication.

Case No. 4- A dead body of an adult male individual was received for medicolegal autopsy after ingestion of some unknown corrosive substance. On examination, Lower incisor teeth shows brownish discoloration in their base. Esophagus mucosa was hyperemic and black in color with sloughing of mucosa at places. Esophagus was adhered to posterior surface of trachea. Mucosa of Larynx was congested and sloughing was present at places. Trachea was Intact. On dissection and opening of the abdominal cavity, peritoneal cavity contained dark brown fluid. Peritoneum was sloughed and perforated at places. The stomach was blackened and the mucosa along the lesser curvature was sloughed and perforated at places. It was preserved for chemical analysis. The report for the chemical analysis came positive for Phenolic Acid.

Discussion:

We discuss here different types of caustics ingestion and find caustic as a cause of death a rare and unconventional method of suicide. Unconventionality of this method of suicide can be explained by offensive smell, risk of getting burned and fear of delayed death. Suicidal deaths by acid are though rare but more commonly related with homicidal death like vitriolage. Ingestion of acid is the only method associated with suicidal tendency but throwing acid over someone's face is the method found with homicidal cases. The mental status of a person, his intent to commit suicide and easy availability of methods are the various factors that play role in choosing this method as suicide. Though acid market is strictly under scrutiny by the regulating authorities but still it's easy to avail the acid by a person who is linked to the industry which uses strong acid. Acute corrosive poisonings are a

serious social-medical issue, both from the sense of clinical presentation and the therapeutical approach as well. Such poisonings cause severe chemical injuries of the upper gastrointestinal tract, most commonly localized to the esophagus and the stomach, presented as difficult clinical signs, in which the clinical investigations are hard to perform, so the treatment and the outcome are often uncertain. The findings on physical examination of an acid ingested patient as reported by Kim N et al.⁴ are localised erythema and erosions in the oropharynx. They reported the CT based tracheobronchial injury caused after acid ingestion. In the autopsy conducted by author, the findings were localised swelling of tongue and oral mucosa with multiple erosions of stomach mucosa with base of ulcers greenish discolored. However, the extent of GI tract injury following ingestion of a corrosive substance depends on a number of factors, including: ingested product formulation, concentration, ingested volume, pH, viscosity, mucosal surface contact duration, and the absence or presence of food in the stomach as stated by Hall AH et al.⁵ Three of the corrosive acids are discussed here.

According to the literature, Nitric acid (aqua fortis; red spirit of nitre) is a clear, colourless, fuming, heavy liquid, and has a peculiar and choking odour. In concentrated form it combines with organic matter and produces a yellow discoloration of tissue due to the production of picric acid (xanthoproteic reaction)⁶. We have also observed yellowish tinge of the gums and teeth in the case no. 1. Nitric acid releases oxides of nitrogen into the air upon exposure to light. Therefore, exposure to nitric acid potentially involves exposure to oxides of nitrogen, especially nitrogen dioxide. Nitric acid is formed in photochemical smog from the reaction between nitric oxide and hydrocarbons. Individuals living in heavily polluted areas may receive chronic inhalation exposure to nitric acid. Usual fatal dose is about 20 to 30 ml. Zargar et al.⁷ in a retrospective study, stated that grade 3b lesion was the most common type found on endoscopy. In the case no. 3 of sulfuric acid ingestion reported by author, the findings were as follows; lips and tongue were blackish and eroded, mucosa of the oral cavity including hard palate was blackish and eroded, mucosa of the esophagus was blackish and eroded all over the length. Stomach contained about 50 cc of blackish mucoid material. Mucosa was eroded.

Sulfuric acid is probably the most widely used industrial chemical in most parts of the world including India. It is used as a feedstock in the manufacture of a number of chemicals. About 20 to 30 ml of concentrate sulfuric acid. Deaths have been reported with ingestion of as little as 3.5 ml. If the amount ingested is significant, there will be signs of shock, with collapse, a weak and rapid pulse, hypotension and possibly death, even if treatment is available straightaway.⁸ In a case reported by Aouad R et al.,⁹ a person with ingestion of sulfuric acid presented with decompensated hemodynamics and developed acute respiratory distress syndrome, acute renal failure, disseminated intravenous coagulation, bilateral pneumothorax, and cardiac arrest. In literature the systemic effects of sulfuric acid ingestion are metabolic acidosis, particularly following ingestion. Acidosis may be due to severe tissue burns and shock, as well as absorption of acid.³ The systemic effects of sulfuric acid also causes death of

person however, the localised effect on gastrointestinal system leading to peritonitis was cause of death in the sulphuric acid ingestion case reported by the author.

Carbolic acid when pure consists of short, colourless, prismatic, needle-like crystals, which have a burning sweetish taste, which turn pink and liquefy when exposed to air. The commercial carbolic acid is a dark-brown liquid 10 to 15 g. The accidental ingestion of carbolic acid by paediatric age group is common due to its use in households. The property of getting absorbed via stomach mucosa is the unique property which differentiates it from other caustics. This is the reason of recommending gastric lavage in cases of carbolic acid ingestion though being of it a corrosive. Phenol is readily absorbed through multiple routes of exposure (ingestion, dermal, inhalational) and distributes widely through the body within minutes. The systemic complications of severe phenol toxicity are myriad. Mental status depression or seizures may result in airway compromise and respiratory failure. Acute respiratory distress syndrome (ARDS) may necessitate mechanical ventilation. Ventricular arrhythmias and/or cardiovascular collapse may occur. Acute kidney injury requiring dialysis may result from extensive rhabdomyolysis or haemoglobinuria due to intravascular haemolysis.¹⁰

As we have discussed medical implications of corrosive ingestion thoroughly now coming to legal implications related to manner of deaths in cases of corrosives. Legal implications related to suicidal deaths in cases of corrosives: Whoever attempts to commit suicide and does any act towards the commission of such offence, shall he punished with simple imprisonment for a term which may extend to one year [or with fine, or with both]. In P Rathnam v. Union of India held section 309 was unconstitutional and void for it violates Article 21. The court also observed that the provision is cruel as it once again punishes a person who had already suffered agony and as a result of which that person attempted suicide. Recently, an attempt to partially decriminalize this section has been made by the government through the Mental Healthcare Act 2017, which says that “any person who attempts to commit suicide shall be thought to suffering through heavy stress and thus not guilty unless proven otherwise”. The most important question that takes place is; what is the limit of severe stress while deciding the case of an attempt to suicide?¹¹

Legal implications related to homicidal deaths in cases of corrosives¹²: Vitriolage or vitriol throwing - It consists of throwing of strong sulphuric acid or as a matter of fact, throwing of any concentrated mineral acid, Corrosive alkalies, Carbolic acid or the acrid juice of Semicarpus Anacardium over the face or body of the victim. The purpose or motive is to disfigure the face,

326 A	Voluntarily causing grievous hurt by use of acid, etc.	Imprisonment for not less than 10 years but which may extend to imprisonment for life and fine to be paid to the victim	Cognizable	Non-Bailable	Court of Sessions
326B	Voluntarily throwing or attempting to throw acid	Imprisonment for 5 years but which may be extended to 7 years and with fine	Cognizable	Non-Bailable	Court of Sessions

destroy the vision or to cause bodily injury or disfigurement of body or even destroy the costly garments or to take revenge.

Conclusion:

Deaths by corrosives are being reported in developing countries. However, suicidal deaths using corrosive ingestion are quite rare and unconventional. The clinical symptoms, investigative observation and treatment outcome varies widely with case to case depending upon the patient profile, tissue affected and concentration of corrosive. However, detailed history taking, psychological profile of patient and medical expert's eye can diagnose the case on time which can save the patient with better prognosis.

Funding: None

Authors contribution: All the authors contributed significantly in this case series.

Conflict of interest: None

Ethical clearance: In Indian legal system, consent of the relatives is not necessary for autopsy performed in medicolegal cases. As these are medicolegal autopsies, case series the particulars of the deceased are not revealed and kept confidential with the authors, so ethical clearance is not required in this present case series.

Acknowledgement: None

References:

- Vij K, Textbook of Forensic Medicine and Toxicology. 5th ed. Chennai, India, Elsevier; 2011.
- Aqua regia, Wikipedia, Updated July 1, 2023. Accessed July 10, 2023. https://en.wikipedia.org/wiki/Aqua_regia.
- Pillay VV. Modern Medical Toxicology. 4th ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd; 2013.
- Kim N, Lee HN, Kim JI, Shin SY, Kang SW. Case report of tracheobronchial injuries after acid ingestion: CT findings with serial follow-up: Airway complication after acid ingestion. *Medicine (Baltimore)*. 2020.
- Hall AH, Jacquemin D, Henny D, Mathieu L, Josset P, Meyer B. Corrosive substances ingestion: a review. *Crit Rev Toxicol*. 2019.
- Reddy KSN, The Essentials of Forensic Medicine and Toxicology. 33rd ed. New Delhi, India, Jaypee Brothers Medical Publishers; 2014.
- Zargar SA, Kochhar R, Mehta S, Mehta SK. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc*. 1991 Mar-Apr;37(2):165-9. doi: 10.1016/s0016-5107(91)70678-0. PMID: 2032601.
- Simpson CK, Simpson's Forensic Medicine. 13th ed. London. Arnold Press; 2003.
- Aouad R, Matar N, Melkane A, Nassar M, Moutran H, Haddad A. Sulfuric Acid Ingestion. *The Journal of Trauma: Injury, Infection, and Critical Care* 2011;70(5):p E98. DOI: 10.1097/TA.0b013e318180a470.

10. Downs JW, Wills BK. Phenol Toxicity. 2022 Jun 20. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. PMID: 31194451.
11. Nanda A. Indian Law Portal. P Rathnam v. Union of India. Published July 21, 2022. Accessed July 10, 2023. <https://indianlawportal.co.in/p-rathnam-v-union-of-india/>
12. Mukharjee JB, Forensic Medicine and Toxicology. 5th ed. Kolkata India, Academic Publishers; 2022.
13. Saukko P, Knight B, Forensic Pathology, Boca Raton. 4th ed. USA, CRC Press; 2016.