Prospective Study of Complications of Corrosive Intoxication of Patients Admitted to Poison Control Center of Ain Shams University Hospitals in 2013

Thesis

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بسم الله الرحمن الرحيم
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Mohamed Hassan Awad

Contents

List of Abbreviations

ARDS	: Adult respiratory distress syndrome
CE	: Corrosive esophagitis
CT	: Computed tomography
EGD	: Esophagogastroduodenoscopy
EGD	: Esophagogastroduodenoscopy
EN	: Enteral nutrition
ESPEN	: European Society for Clinical Nutrition and Metabolism brought a consensual conclusion
GIT	: Gastrointestinal tract
NGT	: Nasogastric tube
NPO	: Nill per os
PCCA	: Poison Control Center of Ain Shams University Hospitals
PN	: Parenteral nutrition
PPD	: Phenylenediamine
PPIs	: Proton pump inhibitors
PT	: Prothrombin time
RADS	: Reactive airways dysfunction syndrome
SIGN	: Scottish Intercollegiate Guidelines Network
SPSS	: Statistical package for social science
SD	: Standard deviation

List of Tables

List of Tables *(Cont...)*

List of Tables (Cont...)

Introduction

Corrosives are a group of chemicals that have the capacity to cause tissue injury on contact by a chemical reaction. They most commonly affect the gastrointestinal tract (GIT), respiratory system and eyes ***(Naik, 2012).***

Acids and alkalis are the two primary types of agents most often responsible for caustic exposures. Exposure to corrosive agents continues to be a leading toxicological source of injury for children and adults ***(Donovan, 2005).***

The common caustic agents include strong acids and alkalis, concentrated weak acids and alkalis, oxidizers (with neutral pH) and alkylating agents ***(Donovan, 2005).***

There are two types of corrosives effects, Alkali ingestion which causes liquefaction necrosis. This process includes protein dissolution, collagen destruction, cell membrane emulsification, sub mucosal vascular thrombosis and cell death. Acid ingestion causes coagulation necrosis. In this process, hydrogen (H+) ions desiccate epithelial cells producing an eschar. This process leads to edema, erythema, mucosal sloughing, ulceration and necrosis of tissues. Both acids and alkalis cause fibrosis (stricture formation) ***(Leikin and Paloucek, 2007).***

Known complications of corrosives are acute or delayed. Acute complications compromise airway, shock (due to hemorrhage,

vomiting or third-space sequestration), gastrointestinal perforation, acute Pancreatitis, dysphagia, problems related to enteral feeding water supply and mediastinitis, or gastric leak/bleed leading to peritonitis ***(Lionte et al., 2007).***

Delayed complications include stricture, obstruction, tracheoesophageal fistula and Carcinoma of esophagus ***(Haddad et al., 1998).***

Management is based on the presenting clinical features on admission to the hospital. This can be divided into emergency management, management of stable patient and long-term management ***(Naik, 2012).***

Aim of the Work

The aim of this work is to study and evaluate cases of corrosive intoxication admitted in the Poison Control Center of Ain Shams University Hospitals from 1/1/ 2013 till 31/12/2013 to determine the common agents, complications and the grading according to Poisoning severity score.

Corrosives

The ingestion of caustic substances is a common condition, which may result in serious injuries of the upper gastrointestinal system and upper airways.

Although the incidence of these injuries has declined due to stricter packaging standards, there are still about 5, 000 cases affecting children every year in the U.S.

In adults, the annual incidence is reported to be 5, 000 to 15, 000 cases. In the adult population, the injuries are frequently more serious because they are intentional, with larger volumes of ingestion, or with ingestion of industrial toxic compounds.

These can result in serious lifelong debilitating conditions such as corrosive esophagitis (CE), esophageal stricture, laryngeal, stenosis and later, development of esophageal cancer ***(Schaffer and Hebert, 2000).***

In Egypt, the following table represents numbers of corrosive intoxicated cases presented to Poison Control Center of Ain Shams University Hospitals (PCCA) during 2011 and 2012:

Table (1): Numbers of corrosive intoxicated cases presented to PCCA during 2011 and 2012.

Total Number	Corrosives	Percentage	Corrosive death
2011 (total no =21550)	1400	6.5%	**4**
2012 (total no 19744)	1215	6.2%	**3**

Types of corrosives

Alkalis

Alkaline material accounts for most cases of caustic ingestion in western countries ***(Gumaste and Dave, 1992).*** Alkalis can be found in a variety of cleaning agents, drain openers, bleaches, toilet bowl cleaners, and detergents. Most commonly used household bleaches contain hydrogen peroxide (3%), sodium hypochlorite or low concentrations of sodium hydroxide (1%), and are mild to moderate irritants with a pH ranging from 10.8 to 11.4. Accidental ingestion produces minimal injury to the gastrointestinal tract; long-term damage including stricture formation is rare. However, the ingestion of large quantities of bleach may be associated with serious damage. Unlike bleaches, drain cleaners are more dangerous. Drain cleaners contain sodium hydroxide in concentrations ranging from 4% to 54% and the crystalline variety tends to contain a higher concentration of sodium hydroxide than the liquid form. These agents can produce severe harm to the gastrointestinal tract including perforation. Stricture formation is consistently seen with ingestion of drain cleaners ***(Moore, 1986).***

Automatic dishwasher detergents contain sodium phosphate or tripolyphosphate that are also powerful corrosive agents ***(Litovitz et al., 2002).***

Clinitest and denture cleaning tablets contain sodium hydroxide and these can cause major esophageal injuries

because their solid form prolongs the duration of contact with the mucosa ***(Spiegel and Sataloff, 1999).***

Hair relaxer, a commercially available alkaline product, is another agent implicated in caustic ingestion. Although these products produce extensive facial injury and oral burns, significant esophageal damage has not been reported ***(Cox and Eisenbeis, 1997).***

Acids

Acid ingestion tends to occur less frequently in the United States (<5%) but appears to be more common in countries like India where hydrochloric acid and sulfuric acid are easily accessible. In the United States, acids are generally available as toilet bowel cleaners (sulfuric, hydrochloric), anti rust compounds (hydrochloric, oxalic, hydrofluoric), battery fluids (sulfuric), and swimming pool cleaners (hydrochloric) ***(Zagar et al., 1989)***.

Types of corrosives listed

Corrosives include concentrated acidic, alkaline, or oxidizing agents. A large number of industrial and commercial products contain potentially toxic concentrations of acids, bases, or other chemicals that can cause burns ***(Cox and Osgood, 1994; Cox, 2010).***

Fulton and Rao (2007) listed common corrosive substances and their sources as follows:

Table (2): Common corrosive substances and their sources

Chemical	Applications
Acetic acid	Permanent wave neutralizers, photographic stop bath
Ammonia (ammonium hydroxide)	Toilet bowl cleaners, metal cleaners and polishes, hair dyes and tints, antirust products, jewelry cleaners, floor strippers, glass cleaners, wax removers
Benzalkonium chloride	Detergents
Boric acid	Roach powders, water softeners, germicide
Formaldehyde, formic acid	Deodorizing tablets, plastic menders, fumigant, embalming agent
Hydrochloric acid (muriatic acid)	Metal and toilet bowl cleaners
Hydrofluoric acid	Antirust products, glass etching, microchip etching
Iodine	Antiseptics
Mercuric chloride ($HgCl_2$)	Preservative
Methylethyl ketone peroxide	Industrial synthetic agent
Oxalic acid	Disinfectants, household bleach, metal polish, antirust products, furniture refinisher
Phenol (creosol, creosote)	Antiseptics, preservatives
Phosphoric acid	Toilet bowl cleaners
Phosphorus	Matches, fireworks, rodenticides, methamphetamine synthesis
Potassium permanganate	antiseptic solution
Selenious acid	Gun bluing agent
Sodium hydroxide	Detergents, clinitest tablets, paint removers, drain cleaners and openers, oven cleaners
Sodium borates, carbonates, phosphates, and silicates	Detergents, electric dishwasher preparations, water softeners
Sodium hypochlorite	Bleaches, cleansers
Sulfuric acid	Automobile batteries, drain cleaners
Zinc chloride	Soldering flux