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An Unpleasant Result of Imprecision: Esophageal Corrosive Injury Due to the Oral Intake of 10% Benzalkonium Chloride

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Authors' contributions

This work was carried out in collaboration between all authors. Authors MB and HO designed the study, wrote the protocol and wrote the first draft of the manuscript. Author SO managed the literature searches, analyses of the study performed the spectroscopy analysis. Author SA managed the experimental process and author BK identified the species of plant. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Benzalkonium chloride is a skin antiseptic agent. It should be diluted before usage for cleaning of mucosal membranes; otherwise it may result in severe damage on mucosa. Herein we will report a 2 months old baby who took 10% Benzalkonium chloride orally by an accident and consequently developed esophageal damage and larynx edema. Our aim was to take attention to the Benzalkonium chloride usage.

Keywords: Benzalkonium chloride; esophageal burn; corrosive ingestion; child.

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1. INTRODUCTION

Ingestion of caustic substances, whether alkaline or acid, may cause severe damage and complications in tissues. Adolescents may take these substances with the intention of suicide. In pediatric age group especially in children younger than 5 years of age, in which 80% of caustic substance intakes are reported, these agents are taken accidentally mainly due to the parenteral inattention [1]. Oral administration of these constituents may cause damage in all upper gastrointestinal system from lips that contact with it, till stomach. Depending on the type of substance, many different clinical pictures ranging from simple mucosal erythema in esophagus or stomach to transmural perforation may be seen in acute periods [2]. After healing, the main complication reported in esophagus is the stricture development which is reported in 30.7% of the cases [2]. Benzalkonium chloride (BAC) is an important caustic substance which is a quaternary ammonium compound present in market in the form of 10% concentrations. This antiseptic agent is in use for cleaning of integrated or damaged skin and mucosal membranes [3]; however, it should be diluted with pure water before usage since the concentrations appropriate for skin may be very irritating for mucosa. Mucosal damage of the gastrointestinal system after ingestion of caustic substances is classified by the endoscopy [4].

In literature, the reports about the effects of BAC ingestion are quite limited [5-7]. Herein we will report the consequences of BAC ingestion in a case with an accident due to the resemblance of its box with an antipyretic agent. Our aim is to take attention of doctors, parents and drug companies to this topic.

2. CASE

In a 2-months old boy, who was newly adopted, 37.8℃ of fever was perceived after the administration of a combination vaccine and the doctor prescribed a Paracetamol suspension. However, the mother mixed up the boxes and accidently gave the baby 5 ml 10% BAC (Zefiran ^{TM}) instead of paracetamol (Fig. 1). Just after the administration; agitation and vomiting was observed on the baby. Then the mother herself tasted the BAC and due to the effects of BAC on her mouth, she brought the baby to the hospital that transferred him to our center.

In his history, it was learnt that his birth weight was 3520 g (at 39 weeks of gestation). In admission, his body weight was 4280 g, his body temperature was 37℃, blood pressure was 80/58 mmHg, heart rate was 168/min and respiratory rate was 62/min. The physical examination of the baby who had restlessness and stridor revealed hyperemia and increased salivation in pharynx together with the coarse crackles; while all other systems were normal. The patient's complete blood count, biochemical tests, blood gas analysis, fecal occult blood test and chest X-ray was normal. Total parenteral nutrition was started since enteral nutrition could not be allowed. Additionally, 100 mg/kg sulbactam-ampicillin, 15 mg/kg amikacin and 3 mg/kg ranitidine were started. In upper gastrointestinal system endoscopy which made after 24 hours, larynx edema with diffuse hyperemia and fibrin plaques were present on last 2 cm of the distal esophagus (Fig. 2). This view was consistent with grade 2a according to Zargar classification. The patient was intubated and mechanically ventilated in SIMV mode (with PEEP:5 cmH2O, PİP:20 cmH2O) due to larynx edema. Moreover 2 mg/kg methylprednisolone was administered in order to diminish the larynx edema. In follow-up, mechanic ventilator was adjusted gradually; at the end of 5th day of treatment the patient was extubated and oral feeding was re-started. At the end of 8th day, his drugs were dis-continued and he was discharged. At the end of 4th week, in barium swallow test there was not any stricture determined development in esophagus. The second evaluation will be carried out in sixth months.

Fig. 1. The boxes of solutions containing paracetamol and BAC in market in our country

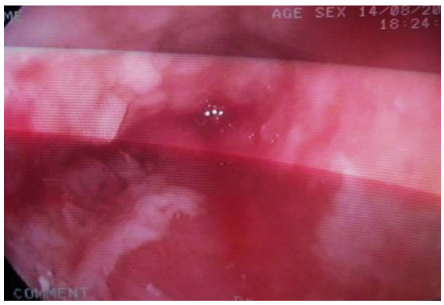

Fig. 2. Disseminated fibrin plaques in esophagus determined in endoscopy

3. DISCUSSION

Look-alike, sound-alike (LASA) medications are responsible for serious poisoning events in children. The similar colors and names of drugs produced by pharmaceutical companies are major causes of this kind of poisoning. Writing LASA medications with highlighting, boldface, unique colors, uppercase lettering or a mix of upper and lower cases are recommended to minimize the drug practice errors [8].

Ingestion of caustic substances such as BAC may cause severe damages depending on the amount, concentration, pH and contact time of the agent. While acidic agents result in coagulation necrosis, alkali ones such as BAC cause liquefaction necrosis [9,10]. The necrosis that may cause perforation is the main source of the clinical picture.

In the study of Turan et al. [7], it was determined that, BAC may be administered to the babies commonly due to the misperception with other drug boxes. Similarly in our case, the main reason of BAC ingestion was the resemblance of its box with Paracetamol suspension.

BAC should be diluted more than 1/1.000 when used for mucosa, while it may be used in 1/100-1/200 concentrations as a skin antiseptic agent [11]. In pharmacies in our country, BAC is sold in forms of 1/10 concentrations. This solution was ingested with a concentration of as high as 1/10 in our patient which should also be diluted for skin usage.

In those cases with high risk of infection due to the mucosal damage, prophylactic intravenous broad-spectrum antibiotics should be given, since it is known that microorganisms may aggravate the clinical picture by invading necrotic tissues. Moreover, oral administration should be stopped with total parenteral nutrition support in order to provide positive nitrogen balance [2,12]. Antibiotics are advised in grade 3 injuries [13]. However the mucosal damage in our patient was compatible with grade 2a according to Zargar classification; prophylactic antibiotics were given not for the mucosal damage but due to the suspicion of lung injury.

The aspiration of caustic substances results in the laryngeal edema. The obstruction in airways may be seen due to the direct damage of agents on airways as well as the edema on glottis and surrounding structures. Another consequence of aspiration is the trachea-bronchitis or chemical pneumonia. The reason of more severe defects on esophagus compared with the pharynx is the elongated contact time of esophagus with the agent [5].

Steroid administration in those cases is still controversial. Some authors recommended the usage of cortisone since it prevents the bacterial migration in gastrointestinal system, reduces inflammation, and prevents mucosal edema and bronchospasm [14] while some authors do not believe in the advantages of this treatment [15]. Though it is controversial, the main reason of steroid usage in our case was to diminish the laryngeal edema. We believe that, one of the reasons of non-development of fibrosis in esophagus in follow-up of this patient is the steroid usage.

4. CONCLUSION

LASA medications are responsible for serious poisoning events in children. Physicians should be aware of this condition and should pay attention to them when writing prescription. The role of drug companies is the avoidance of construction of drugs or chemicals that have resembling names or boxes. Parents should be very careful while giving medications to the children and should review the contents of all medications before using.

CONSENT

All authors declare that ‘written informed consent was obtained from the patient (or other approved parties) for publication of this paper and accompanying images’.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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