

Clinical Characteristics and Complications in Oral Caustic Ingestion in Children

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Abstract: The aim of this study is to evaluate the prevalence of gastrointestinal symptoms in caustic ingestion, the severity of lesions and the role of early conducted endoscopy in prediction of outcome. In a cross-sectional study all children hospitalized for caustic ingestion during two years, aged 12 years and younger were evaluated for clinical history, endoscopic findings, method of treatment and observed complications. Out of 51 children, 8 consumed acidic and 43 alkaline materials. The mean age of the children was 35.9 ± 18 months. Thirty four (66.7%) patients were male and 17 (33.3%) were female. In endoscopic survey, 38% had grade 1 and 62% had a burning intensity of grade 2 or higher. During the follow-up, esophageal structure developed in 5 cases and Gastric Outlet Obstruction (GOO) in 1 case. Two of 5 patients with stricture were treated by endoscopic dilatation and 3 of them underwent colon transposition surgery. Gastrectomy was done for the patient with GOO. Esophageal structure as a complication had a more incidence in acid ingestion. Gastric Outlet Obstruction (GOO) occurred in a case of acid ingestion. One of the patients died. Positive statistical relation between early endoscopic findings and complications found in control endoscopy suggest that early endoscopy probably is safe and provides important prognostic information. The role of prevention as a comprehensive strategy promoted by medical councils and the mass media is imperative.

Key words: Endoscopy, alkali, acid, gastrectomy, outcome

INTRODUCTION

Caustic ingestion is a significant concern in both developing and some areas of developed countries with an incidence ranging between 5000 to 15000 cases per year in USA (De Jong *et al.*, 2001; Bautista *et al.*, 1997; Rothstein, 1986). Ingestion of these agents led to serious upper aerodigestive and esophageal injuries (Cheng *et al.*, 2008). The majority of cases are in children younger than 5 years (Dogan *et al.*, 2006). In children, most such events are accidental; in adults, ingestion usually is a deliberate attempt due to suicidal intent (Cheng *et al.*, 2008). The male to female ratio is said to be 1.2 to 1.4:1 (Walker *et al.*, 2004). A variety of products may be responsible for the burns in caustic ingestion injury. The two major groups are alkalis and acids. The most common type of agents causing mucosal burns in children are alkalis. They produce a liquefactive necrosis when they come in contact with mucosa and penetrate deeply with full thickness burns common. Acidic substances result in a coagulation necrosis that usually limits the penetration of the acid substance (De Jong *et al.*, 2001; Cheng *et al.*, 2008). Although some substances such as water can be used to wash the caustic agent from buccal cavity, there is no recommendation for the use of diluents, emetics, lavage and charcoal. A complete examination of the mouth and pharynx is

needed. The majority of clinical experts recommend flexible esophagoscopy within the first 12 to 36 h after caustic ingestion. Reported sequelae of caustic ingestions are structure formation, achalasia, brachyoesophagus, gastroesophageal reflux and as the most serious complication, development of cancer (Walker *et al.*, 2004). With regard to the lack of a comprehensive study about caustic ingestion in children in our area and the increasing incidence of the injuries induced by their use and in order to consider the importance of this subject, this study was designed to assess the type and severity of caustic ingestion and evaluate clinical findings and prognostic view of this problem.

MATERIALS AND METHODS

In a cross-sectional survey, 51 patients with caustic ingestion admitted in Tabriz Children Hospital during 2 years from March 2006 to March 2008 were studied. Inclusion criteria were defined as age <12 years and a history of caustic ingestion. Exclusion criteria were refusal to baseline (primary) endoscopy or control endoscopy and the death of patient.

For most children endoscopy was done during 24-48 h of admission and injuries were classified based on initial endoscopic findings and esophagitis scoring was defined according to Millar *et al.* (2006). Endoscopes

used were Olympus GIFP20 (Olympus Tokyo, Japan); Gentle insufflations and retrovisual methods were performed carefully. For all children, ENT (ear, nose, throat) consult was done to rule out oropharyngeal lesions. Patients were treated with a proton pump inhibitor or H_2 antagonist and were maintained without oral intake until their condition was considered stable. Patients received parenteral nutrition during this period. At discharge time, patients were advised to return for follow-up visit 4 weeks later in order to undergo control endoscopy and barium swallow.

If any structure was detected by these paraclinical modalities, esophageal dilatation or colon transposition were carried out. Within 6-12 months of the control endoscopy we followed patients by phone and asked them about general condition and symptoms such as vomiting, abdominal pain, sialorrhea, growth failure and dysphagia.

Data were analysed by SPSS 13 software using statistical Chi-square test and stated as percent.

RESULTS

Fifty one patients were identified over the 2-year period. Of these cases, 34 (66.7%) were male, 17 (33.3%) were female and the ages of the patients ranged from 1 to 96 months (mean age, 35.94 ± 18.21 months). The mean duration of hospital stay was 3.15 ± 2.6 days ranging between 1 to 10 days. In 43 cases (84.3%), the offending substance was alkali while in 8 cases (15.7%) it was acid.

There was a positive statistical relation between the duration of hospital stay and the type of corrosive material ($p = 0.002$). The mean duration of hospital stay for acidic ingestions was more than it for alkaline agents.

Forty seven patients out of 51 (92.2%) were symptomatic on admission; 39 ones of these symptomatic cases (76.5%) ingested alkaline agents and 8 patients (15.7%) acidic material. Four patients were asymptomatic who all had ingested alkalis. The relation between being symptomatic on admission and the type of corrosive agents was not significant ($p = 0.36$). In 43 cases (89.6%) H_2 blocker or omeprazole, in 23 ones (47.0%) metoclopramide, in 13 patients (25.4%) corticosteroids and in 14 ones (29.2%) antibiotics were used.

The most common symptom was vomiting followed by nausea, mouthburn, abdominal pain, sialorrhea, dysphagia, odynophagia and dysphonia in a decremental order.

There was significant differences between esophageal lesions induced by two groups of agents. In acid ingestion the esophageal lesions in baseline endoscopy were more severe than those induced by alkaline agents ($p = 0.02$).

Table 1: Primary endoscopic findings in children

Grade	Acid		Alkali		Overall	
	F	p (%)	F	p (%)	F	p (%)
0	0	0.0	0	0.0	0	0.0
1	1	2.0	18	35.2	19	37.2
2a	0	0.0	1	2.0	1	2.0
2b	3	5.9	18	35.2	21	41.1
3a	0	0.0	4	7.8	4	7.8
3b	4	7.8	2	3.9	6	11.7
Total	9	15.7	43	84.1	51	100.0

F: Prevalence, P: Prevalence percentage

Table 2: Control endoscopic findings in children

Parameters	Mild		Necrotic lesion (%)	Esophageal structure (%)	GOO (%)	Overall mean
	Normal (%)	esophagitis (%)				
Acid	2.00	5.9	0	5.9	2	15.7
Alkali	54.90	25.5	2	2.0	0	84.3
Overall mean	56.90	31.4	2	7.8	2	100.0

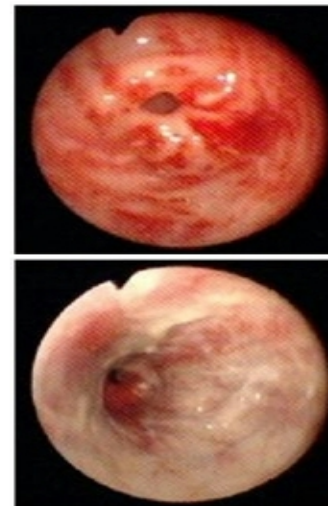


Fig. 1: Two years old girl ingesting alkali agents with esophageal and stomach burns

There was significant difference among the findings of control endoscopy and type of caustic agents ($p = 0.002$). Esophageal structure as a complication was more in acid ingestion. Gastric Outlet Obstruction (GOO) was also present in a case of acid ingestion (Table 1).

Findings on baseline and control endoscopy were closely match and the statistical relation was significant ($p = 0.000$). In the cases with a baseline endoscopy matching grade 1, the control endoscopic findings were usually normal while in the presence of lesions matching grade 2 or with the severity more than grade 2 in early endoscopy, there were more reports of esophagitis and structure in control endoscopy (Table 2).

Figure 1 shows endoscopic view of an infant girl who ingested alkali.

For all 51 patients barium swallow was done within 1 month of endoscopy that was normal in 44 cases and associated with pathologic findings in 7 ones.

Fifty one patients, for 6 ones (11.7%) interventional surgery was done because of severe gastrointestinal complications leading to colon transposition (3 cases), esophageal dilatation (2 ones) and partial gastrectomy (1 patient).

DISCUSSION

Corrosive ingestion is a great problem in our country and is increased as a result of their being more available as household cleaners.

They are usually ingested by children accidentally (Cheng *et al.*, 2008; Ertekin *et al.*, 2004; Gupta *et al.*, 2001). The extent of mucosal damage is influenced by factors such as pH and the physical state of the agent. Substances in a solid form usually produce a localized burn while in a liquid form the lesion usually has a diffuse pattern (De Jong *et al.*, 2001; Chistesén, 1994).

Children younger than 5 years include the highest risk group for accidental caustic ingestion (Wasserman and Ginsburg, 1985; Huang *et al.*, 2004).

In this study peak age of caustic ingestion was 3 years and male to female ratio was 2 to 1 that corresponds other studies (Walker *et al.*, 2004).

The most common type of corrosive agents ingested in this study were alkalis (84.3%). There are some studies confirming more prevalence for alkalis (De Jong *et al.*, 2001; Cheng *et al.*, 2008).

In the study of Wijburg *et al.* (1989) esophageal lesions were present in 39% of the children suspected of having ingested a caustic agent. Dogan *et al.* (2006) found esophageal injuries in 80.1% of all cases. The severity of esophageal lesions detected by baseline endoscopy has a wide spectrum in several studies.

In present study there was no case reported as normal in baseline endoscopy; 37.2% of the patients were defined as grade 1 and the remaining 62.8% had lesions with severity match to grade 2 and more. The absence of any normal report in early endoscopy may be attributed to the refusal of parents to endoscopy in cases who were asymptomatic or ingested very dilute corrosive agents.

In the study of Trabelsi *et al.* (1990) endoscopic findings were normal in 46 patients out of 100 ones while grade 2 and more lesions were present in 26 cases.

In the research done by Lamireau *et al.* (1997) 43% of patients had no detectable endoscopic lesion with a No. of 26% having lesions grade 2 and more. In this study the severity of lesions was more than most other studies.

There is a wide spectrum of reports for morbidity specially about structure formation.

In earlier studies, the frequency of stricture formation after caustic ingestion varied between 5 and 75% (Mamede and DeMello Filho, 2002; Garcia *et al.*, 2001; Anderson *et al.*, 1990).

The development of esophageal structures is dependent upon the depth and circumferential nature of the corrosive injury. Alkalis are said to be associated with more esophageal structures (Cecconello *et al.*, 1995). In this study structures induced by acidic agents were more than alkaline subjects.

None of studied patients developed esophageal perforation while there are various reports of perforation after acidic ingestion some necessitating surgical repair (Mamede and DeMello Filho, 2002; Garcia *et al.*, 2001; Hager and Manardi, 1990; DiCostanzo *et al.*, 1980).

Because caustic injury causes esophageal dysmotility and gastroesophageal reflux, antacids and H₂-blockers are indicated (Rothstein, 1986).

In a review of 14 clinical studies in which over 2000 patients were involved, no significant difference could be shown in the incidence of structure formation between the cases treated with steroids and the control group (Oakes *et al.*, 1982).

In a study conducted in three pediatric gastroenterology centers in which only grade 3 caustic esophagitis was considered and evaluated, a decrease in secondary structure formation was reported in 15 of 21 children managed with early high dose of steroids (Boukthir *et al.*, 2004). Corticosteroids were used for 13 patients (25.5%) in present study.

Esophageal dilatation is an invasive procedure for the treatment of esophageal structures; however in cases of grade 2b, 3a and 3b injuries serial esophageal dilatation is associated with a high failure rate and esophageal replacement therapy is usually unavoidable. Failure to obtain an appropriate dilatation is considered an indication for esophageal replacement (Walker *et al.*, 2004; Erdogan *et al.*, 2000; Cohen *et al.*, 1974).

Esophageal stenting is another procedure used to decrease the likelihood of structure formation for several decades. According to Broto *et al.* (2003) and Zhou *et al.* (2005) study this procedure was associated with success and had lots of advantages.

In present study only one patient suffered gastrectomy as a result of Gastric Outlet Stricture (GOO).

In the study of Ozcan *et al.* (2004) who developed in 8 of 98 children (8.2%). Ciftci *et al.* (1999) reported GOO in 9 (5.3%) of 168 studied patients. These two studies reported a more number of GOO in comparison with present study.

Esophageal carcinoma is a late and serious complication in caustic ingestion with a thousand fold increased incidence. Carcinoma can develop in isolated sites of esophageal strictures left *in situ* after replacement therapy. The time interval between the injury and the diagnosis of cancer has a wide spectrum from 13 to 71 years that emphasizes regular follow-up visits (Walker *et al.*, 2004).

Mortality rate is generally low and in excess of 20% of cases occurs as a result of the development of mediastinitis, septic shock and empyema (Garcia *et al.*, 2001; Gundogdu *et al.*, 1992).

In this study there was only one patient who died as a result of caustic ingestion. This case was a 12-year old boy who used drain cleaner in large volume with suicidal intent and died once he arrived in emergency department. This case was excluded of study.

CONCLUSION

In conclusion, Caustic ingestion is easily preventable. Endoscopy done within the first 48 h following caustic ingestion to classify mucosal injury subsequent to caustic ingestion is useful to determine the severity of injury and thus helpful in predicting outcomes. Patients with findings of high grade burns on endoscopy have the risk of perforation and complications while if normal in baseline endoscopy, there is no or minimal risk and no need for more follow-up.

With respect to the early and late complications of caustic ingestion, protecting children from corrosive ingestion is a complex job that has educational and financial dimensions, concerning families, community and the government.

ACKNOWLEDGMENTS

Our thanks go to Dr. Elham Eghbali for her help in preparing this study. We would also like to acknowledge the important contributions made by the staff of pediatric endoscopy ward.

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