

Corrosive Injury to Oro-Pharynx and Esophagus

Eighty-Five Consecutive Cases

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■ *In 85 consecutive cases of ingestion of caustic material, 70 patients had oral burns, 29 incurred esophageal burns, and in three esophageal stricture developed, requiring repeated dilatation. Management involves early endoscopy to determine the extent of mucosal injury, antibiotics to reduce local or mediastinal infection, and steroids to prevent the chance for esophageal stricture.*

IN THE PAST FEW YEARS, crystalline and liquid drain cleaners have become widely used. Their unguarded and often ubiquitous presence in the household makes them very tempting to children. The result is a rising rate of ingestion of these corrosive household caustics. Swallowing them may cause not only immediate damage or death but may also entail life-long sequelae.

Eighty-five consecutive cases of caustic ingestion treated at the Sacramento Medical Center, a metropolitan general hospital, were reviewed. The series covered a five-year period beginning in 1967. Seventy of the 85 patients were 1 to 5 years old and 63 of them were under 3 years. None was younger than 1 year. There were no cases in the 6 to 15 year old group. Fifteen patients were older than 15 years, ranging upward to 51 years.

Readily available household caustics were the principal agents ingested. During the five years covered by this review, Drano®, a crystalline al-

kali cleaner with a sodium hydroxide concentration of 54 percent, was the damaging agent in 44 of the cases. Soluble lye such as Liquid Plumr®, with a sodium hydroxide concentration of 30.5 percent, accounted for 16 of the cases reported. In the remaining 25 cases, ammonium hydroxide and various household cleaners containing caustic material were reported.

The children were always brought to the emergency room by their mothers. Invariably it was the mother who discovered the misadventure and provided the initial clinical history. Eighty of the patients ingested the caustic material at home. The remaining five found it in the garage, yard, at a neighbor's home or at work. Fifty percent of the patients were given milk, water, vinegar or citrus juices in the period immediately following ingestion. Ninety percent of the patients were brought to the emergency room within one hour of ingestion and all arrived within two hours.

In 15 of the 85 patients no oropharyngeal abnormalities were noted on initial examination in the emergency room. However, a high level of suspicion of ingestion existed because of evidence of the caustic material found on their

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clothes or because of burns on the hands or face. In other cases, oropharyngeal lesions ranged from a few scattered areas of superficial mucosal erosion of the lips or tongue in 61 patients to deep and extensive destruction of the lingual, buccal and pharyngeal mucosa in nine cases.

In 78 of the 85 cases, direct laryngoscopy and esophagoscopy were performed within 24 hours. Twenty-nine of the 70 patients with oral burns had mucosal esophageal injury as well. These lesions varied from small circumscribed areas of superficial erosion to diffuse full thickness desquamation of the hypopharynx and esophagus. Correlation existed between the degree of oral and esophageal involvement. Of the nine patients with extensive burns of the oropharynx all had esophageal burns, six with deep circumferential and three with less severe esophageal damage. Only three patients with esophageal burns had no oropharyngeal burns. Esophagoscopy examination was not done in seven of the patients, for a variety of reasons. One of these seven was treated with steroids and antibiotics. Six were sent home without therapy within 72 hours after admission.

There were no complications associated with initial esophagoscopy when performed in the first 24 hours. Two instances of esophageal perforation occurred from subsequent instrumentation. In one patient requiring repeated esophagoscopy and dilatation the esophagus was perforated 3 cm above the diaphragm 73 days after the initial injury. The perforation was immediately detected and thoracotomy and primary esophageal repair were performed without problem. A second case of perforation occurred during repeat instrumentation 38 days after ingestion of the caustic material. This was in a 3-year-old girl who had severe and extensive oro-esophageal burns requiring repeated instrumentation. At the third dilatation a perforation of the cervical esophagus was noted immediately above the level of stricture. Drainage of the cervical mediastinum and gastrostomy were performed. There were no further difficulties and subsequently repeated dilatations were carried out.

Of the 29 patients in whom esophageal findings were noted, 25 later had repeat endoscopy. Four were lost to follow-up. In three of the 25, strictures had formed which required multiple admissions for esophageal dilatation. One was

the previously mentioned 3-year-old and the other two were adults. The remaining 22 patients had no evidence of stricture on repeat examination.

Management

For all patients presenting at the Sacramento Medical Center with a history indicative of ingestion of caustic agents a complete history is taken and on physical examination special attention is given to the oro-pharynx. If there is any evidence or suspicion of ingestion, the patient is forthwith admitted to hospital. No antidotes or emetics are administered and lavage and nasogastric intubation is avoided. Attempt is made to find the container of the ingested material or some of the material itself for proper identification.

Esophagoscopy is done upon admission or not later than 24 hours following ingestion. Patients with obvious second or third degree oropharyngeal burns are immediately given antibiotics (ampicillin 40 mg per kg of body weight per day in divided doses) and intravenous steroids (methylprednisolone sodium succinate, 20 mg every 8 hours for patients under the age of 2 years or 40 mg every 8 hours for those over 2. If there are only minor burns or it appears unlikely that a caustic was actually swallowed, no medications are given before esophagoscopy. If there is no evidence of mucosal damage on endoscopy, the patient is discharged without further care. If mucosal burns are demonstrated, steroids are continued for a minimum of seven days. The antibiotics are discontinued at five days if the patient is afebrile. At the end of a week esophagoscopy examination is repeated. If all lesions have healed, antibiotics are discontinued and the dosage of steroids tapered. A barium swallow study for baseline purposes is obtained, and the patient is then discharged to be seen at monthly intervals. If eschar or granulation tissue is still present when repeat endoscopy is done, a switch is made from methylprednisolone sodium succinate intravenously to methylprednisolone acetate given intramuscularly, 4 mg per kg of body weight per week in two divided doses.

Therapeutic esophagoscopy and dilatation are performed thereafter as needed until healing is complete and deglutition is adequate. At such time, steroids are tapered off and barium swallow

studies are done at intervals of six weeks, three months, six months and one year to observe any late stricture formation.

Discussion

Alkali in the concentrations found in commercially available household cleaners acts on oral, pharyngeal, and esophageal mucosal membranes within seconds, causing coagulation of cell proteins. The extent and depth of the initial injury depend upon the concentration, quantity and duration of contact with it. The depth varies from superficial hyperemia to ulceration of the mucosa, with or without slough. Severe burns involve the periesophageal tissue.^{1,2,3}

Spontaneous repair after such an injury begins with the appearance of fibroblasts on the third or fourth day and the development of collagen begins between the eighth and twelfth days. By the end of the third week, collagen fibers begin to contract, producing distortion and narrowing. With circumferential burns, the esophageal lumen can be severely compromised as scar contracture progresses. Subsequent replacement of the muscular layer by scar leads to disruption of normal peristaltic movements. After four or five weeks, the healing of a severe burn may distort and greatly narrow esophagus in untreated cases.

In the present study 55 of the 70 patients under the age of six years had oral burns, but only 18 had esophageal involvement also. Of the 15 patients aged 16 and over, all had oral burns but only 11 had esophageal burns. The primary reason for this variance is the fact that most children spit out caustic material immediately upon tasting it, whereas adults bent on suicide deliberately try to swallow it.

The main causative agent in our series was a dry granular form of lye, Drano®. Liquids such as Liquid-Plumr® penetrate tissues rapidly and cause extensive damage in a much shorter time than dry lye. Hence, there is a greater chance for esophageal as well as oro-pharyngeal burns with liquid agents. In the present series and in others only 10 to 25 percent of patients who ingested granular lye had serious esophageal burns, against more than 50 percent of those who swallowed liquid lye.^{5,6,7}

Sobell⁸ pointed out that the typical poisoning of children occurs while the mother is in the immediate proximity or at least in the home. Our

series confirms this finding. Sobell also noted that he could identify no relationship between the incidence of childhood poisoning and the storage practices of the families involved. One can only conclude that the very presence of any toxic agent in the home constitutes an attraction and consequently a threat, the magnitude of which depends upon the age and ingenuity of the child.

Baltimore⁹ reached some interesting conclusions pertaining to parental knowledge of potential toxicology of common household products. In interviewing mothers of both poisoned and unpoisoned children, he found their knowledge of immediate treatment of the ingestion of toxics to be very good. Also, most of the mothers felt they had taken reasonable measures to keep these agents away from their children. In our series, approximately 60 percent of the mothers followed the instructions on the American Medical Association "poison chart." They did not attempt to induce vomiting and give emetics. They did give milk, citrus fruit juices or vinegar. In all cases, the child was brought almost immediately to the emergency room.

Unlike Yarrington who reported¹⁰ that histories provided by mothers in his series were "invariably inaccurate," we found the mothers' information highly reliable. However, because of three instances in which the ingested material turned out to be something entirely different than was initially reported, we always ask to see the container of the material involved.

Hollinger and others^{2,6} oppose early esophagoscopy when lye burns are suspected because of the risk of esophageal perforation. However, the complication is infrequent. In Alford's¹¹ series of 69 cases in which esophagoscopy was performed soon after caustic ingestion was diagnosed, there were no complications. Yarrington¹² had no complications in his series of 70 patients. In our series there was no morbidity associated with the initial endoscopy in the 78 patients. The esophagoscope should be passed only as far as the first identifiable mucosal lesion and not beyond. Daly¹³ reported three perforations in 105 esophagoscopy examinations and stated that "none of these would have occurred if the esophagoscope had not been passed beyond the first burned area." The two perforations in our series occurred during subsequent instrumentation several weeks later. The patients in both cases had

complicated esophageal stricture requiring therapeutic rather than diagnostic esophagoscopy.

Following Spain's report¹⁴ that the early administration of cortisone had an inhibitory effect upon the formation of granulation tissue and the fibroblastic reaction, Rosenberg¹⁵ experimented with cortisone after induced lye burns in the esophagus of rabbits. He noted a significant decrease in the fibroblastic response and, subsequently, decreased scar formation and stenosis. At first, infection developed as a concomitant of the administration of steroids in these experiments, but this was subsequently overcome by giving penicillin at the same time.¹⁶ Weisskopf¹⁷ and later Johnson,¹⁸ performing similar experiments in dogs, found that stricture did not develop in any of the steroid-treated animals, whereas all of the controls had stricture after 35 days. Weisskopf also made the important observation that unless steroids were given within 48 hours they did not prevent the formation of granulation tissue.

As a result of these experiments, several clinicians began to employ steroids in the treatment of caustic burns of the esophagus. Ray and Morgan,¹⁹ using steroids and antibiotics, found stricture development in only one of eleven patients. Twenty-three patients were treated by Cleveland,²⁰ and stricture developed in five. Middlekamp⁷ noted stricture formation in three of 21 patients treated with steroids and antibiotics, and all three had third degree esophageal burns. In Cannon's series of 59 patients with corrosive esophageal injury, stricture developed in three while receiving steroids. In our series, three of 29 patients with esophageal burns developed strictures. The stricture rate in all series reviewed appears to be between five and 15 percent in patients treated with steroids. Alford¹¹ reported stricture in 17 cases of 32 cases of caustic burns of the esophagus but none of the patients were treated with steroids.

It is important to note that for steroids to be fully effective, they must be started as soon as possible after the initial injury. In patients with extensive oropharyngeal involvement and strong probability of esophageal injury, steroids should be started immediately regardless of when esophago-

scopy is to be done. The risk of stricture formation far exceeds any possible complications of a short course of steroids. In this series methylprednisolone sodium succinate and methylprednisolone acetate were used because of their rapid absorption and elimination, high blood levels, potent anti-inflammatory activity, and relative absence of side effects.

Because of the presence of necrotic tissue, breakdown in the esophageal mucosal barrier and use of steroids, simultaneous antibiotic therapy is essential. In this series, ampicillin was the drug of choice because of its highly effective action against the oropharyngeal flora.

TRADE AND GENERIC NAMES OF DRUGS

Solumedrol®methylprednisolone sodium succinate
Depomedrol®methylprednisolone acetate

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