Clinical Features of Corrosive Ingestion

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Abstract

Objective : To study the clinical presentation after corrosive ingestion.

Setting : A University Hospital.

Design : Prospective descriptive study.

Patients and Method : Corrosive ingestion patients were studied, from July 2000 to December 2002. Reasons for ingestion, symptoms, physical findings and routine investigations were recorded in a standard form. Data analysed using the descriptive statistical method.

Results : There were 73 patients, 55 women and 18 men, median age 22 years, 48 (65.8%) of whom had ingested strong acid, 3 (4.1%) ingested strong alkali. Suicidal gesture was the most common reason for ingestion (89.2%). The amount of ingestion was less in accidental cases. Symptoms of nausea/vomiting, drooling and abdominal tenderness were associated with the amount of ingestion, while severity of lips, buccal mucosa and palate injuries was significantly related with strong corrosive agents ($p < 0.05$). Leucocytosis was found in patients who had symptoms of drooling, hoarseness, stridor and signs of mucosal slough or superficial ulcers ($p < 0.05$). Four required surgery. Two of them had esophago-gastrectomy. Twenty-one patients were followed-up, with the median follow-up time of 11 (1-28) months. One patient died from HIV infection. The rest were normal.

Conclusion : Drooling and oral mucosal slough or ulcers were significant findings and were related to the amount and strength of the corrosive substance ingested, respectively. To meet the goal of a holistic approach, attention must also be given to psychiatric management, and surgeons should provide a supportive role.

Key word : Corrosive Ingestion, Corrosive Injury, Clinical Presentation, Suicide, Adjustment Disorder, Epidemiology

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Although corrosive injury of the alimentary tract is not common, it has increased since the economic crisis, especially among industrial workers[1, 2]. It seems that a number of people deal with their problems by ingesting corrosive agents. In the East, ingestion of acid is not rare and usually occurs among adults, while alkali substance accounts for most cases of caustic ingestion in Western countries[1-6]. Due to the universal coverage policy in Thailand, patients must go to their designated area. Physicians in primary care units or emergency rooms, gastroenterologists, and surgeons therefore need to have enough knowledge of the clinical presentation, severity of disease as well as to be able to make a decision if a patient needs to be refered to a specialist or to be undergo further investigation. The present study was a prospective study of the clinical presentation of corrosive ingestion patients in a university hospital. The results from the epidemiological data from the patients will benefit further management and decision making.

MATERIAL AND METHOD

This study was carried at Thammasart University Hospital, which is located in an industrial area in the north of Bangkok. For two and a half years, from July 2000 to December 2002, 73 adult patients who had a definite history of corrosive ingestions, were managed in the surgical department. All were inspected by the surgeon after admission. Medical history and physical examinations were recorded in a standard form. Complete blood count, urine analysis and chest film were done on necessary patients. All patients had flexible endoscopic examination within 24 hours after admission. Endoscopic findings indicated further evaluation and management. After endoscopic evaluation, the amount of ingestion was measured by asking the patients to drink water in the same volume of ingestion. However, this was not done on the patients who needed an emergency operation. If the cause of ingestion was uncertain, patients would be put under psychiatric care and evaluated by a psychiatrist. At least one month after ingestion, the patients' symptoms were assessed *via* telephone and letters.

Data were analysed by using descriptive statistics : mean, SD, median and percentage. Chi-square was used for categorical data analysis. *T*-test and Mann Whitney U test were used to compare two continuous data. P-value of 0.05 was considered as statistical significance.

RESULTS

All 73 patients were reviewed. They were 55 women and 18 men with the median age of 22 years (range 14-61 years). Seven patients were suicidal attempt cases, and four patients were accidental ingestion cases. Other than these suicidal gesture cases, the common cause was a brawl between couples (Table 1). There was no association between reason for ingestion, sex and age. However, patients in the accidental group were older. The average duration between ingestion and emergency room arrival was 60 minutes (range 10 min - 20 h). Eighty per cent of the studied patients and all accidental patients ingested without dilution. All had ingested the liquid form; 48 (65.8%) ingested strong acid, 3 (4.1%) ingested strong alkali. Of the 48 cases, one ingested hydrofunic acid, 47 ingested hydrochloric acid which is an active agent and used widely as a household toilet cleaning agent. Of the three alkali intakers, 2 took sodium hydroxide (caustic soda) and the other sodium bicarbonate. Eight patients (11%) ingested other household cleaning agents, 6 (8.2%) ingested dishwashing liquid or detergent and 8 (11%) ingested household bleaching liquid which are mildly corrosive. The amount of ingestion was less in accidental cases (median 20 ml), compared to others (median 30, 35 ml), but was not statistically significant (Table 2).

Table 1. Reasons for corrosive ingestion classified by sex and age (yr).

Reasons	Female (n = 55)		Male (n = 18)	
	%	Median age (Min-Max)	%	Median age (Min-Max)
Suicidal gesture	89.1	21 (14-35)	72.2	23 (16-32)
Suicidal attempt	9.1	22 (19-39)	11.1	21 (19-23)
Accident	1.8	61 (61)	16.7	33 (18-37)
Total	100		100	

Table 2. Substance ingested, reason and average amount (median) of corrosive substance.

Substance	Reasons for corrosive ingestion							
	Suicidal gesture		Suicide attempt		Accident		Total	
	N	Amount (ml)	N	Amount (ml)	N	Amount (ml)	N	%
Strong acid	43	25	3	30	2	27.5	48	65.8
Strong alkali	1	45	1	45	1	15	3	4.1
Household cleaner	5	110	3	65			8	11.0
Detergent, Dish washer	6	52.5					6	8.2
Household bleach	7	20			1	15	8	11.0
Total	62	30	7	35	4	20	73	100

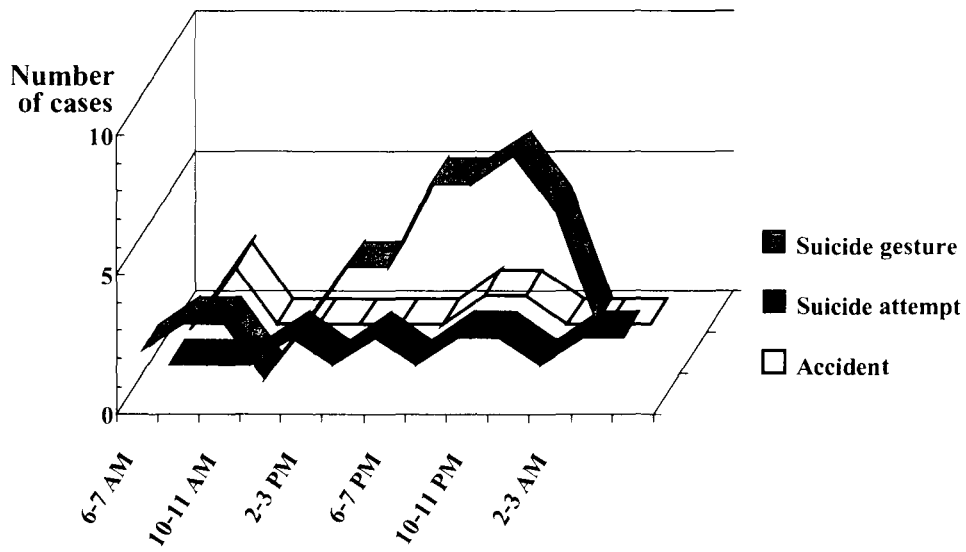

Fig. 1. Number of cases classified by reasons for ingestion and time.

Seven suicidal attempt patients ingested strong acid, strong alkali or a household cleaning agent, while suicidal gesture patients ingested all types of agent ($p = 0.02$). In most suicidal gesture patients, ingestion occurred at night (Fig. 1).

There was an association between the nausea/vomiting symptom and amount of ingestion. Patients who had nausea with vomiting symptoms ingested a significantly larger amount (Table 3).

Symptoms of drooling and abdominal tenderness related to the amount of ingestion, statistical significance ($p = 0.013$). But the amount had no effect on stridor or hoarseness (Table 3).

Physical examination findings are shown in Table 4, comparing the type of agents and physical findings. Strong acid or strong alkali injured oral mucosa more than the other household agents, regardless of the amount.

All 3/3 stridor patients also had drooling and hoarseness. Only 9/13 of with patients hoarseness had drooling.

In laboratory investigations, leucocytosis was higher in patients who had mucosal slough or superficial ulcer when compared to mucosal hyperemia or normal. Moreover, leucocyte was increased in patients with drooling or hoarseness or stridor (Table 5).

Four patients needed surgical management. The most severely injured patient had esophago-gastrectomy with pancreatico-duodenectomy and colonic interposition 6 months later. One had esophago-gast-

Table 3. Symptoms and average amount of substance.

Symptoms	N	Amount (ml) Mean	Median	Min-Max	Mann-Whitney U test
Nausea and vomiting	51	62.0	40	5-300	$p < 0.001$
None or nausea or vomiting	17	18.7	15	5-60	
Drooling	18	76.9	45	10-300	$p = 0.013$
Without drooling	49	38.9	25	5-200	
Abdominal tenderness	30	61.1	45	10-200	$p = 0.013$
Normal abdomen	43	45.1	20	5-200	
Stridor	3	91.7	45	30-200	NS
Without stridor	70	49.3	30	5-300	
Hoarseness	14	55.0	30	15-200	NS
Without hoarseness	58	47.5	30	5-300	

NS = Not significant ($p > 0.05$)

Table 4. Oral mucosal injury classified by type of corrosive substances.

Oral mucosal injury	Strong acid or Strong alkali (n = 51)	Household cleanner, bleach, dish-washer, detergent (n = 22)	Chi square
Lips			
Normal	29	20	
Hyperemia	13	1	$p = 0.005$
Superficial ulcer	8	1	
Buccal mucosa			
Normal	32	19	
Hyperemia	8	2	$p = 0.047$
Superficial ulcer	10	1	
Tongue			
Normal	35	19	
Hyperemia	4	1	NS
Superficial ulcer	11	2	
Palate			
Normal	32	20	
Hyperemia	11	1	$p = 0.005$
Superficial ulcer	7		

NS = Not significant ($p > 0.05$)

rectomy with colonic interposition. One had gastrojejunostomy, because of gastric outlet obstruction. One had exploratory laparotomy and jejunostomy. The rest had conservative treatment. All patients were alive before discharge.

Follow-up was done by telephone and mail. The median follow-up time was 11 months (1-28 months). 18/18 patients answered the telephone. The others were followed *via* mail and three of them answered. One patient died from HIV infection about 2 years after ingestion. He ingested 3 mouthfuls of caustic soda and had severe necrosis from hypopharynx to the proximal jejunum. He needed dilatation many times, and nutritional support was continued by jejunostomy feeding. All patients who responded are healthy without swallowing symptoms.

DISCUSSION

Corrosive substances cause destruction of contact tissue. Concentration of the active agent in products is reduced in Australia[7]. In Thailand, most toilet cleaning liquids contain hydrochloric acid as an active agent which makes them affordable and therefore the favorite intake corrosive agent. Recent improvements in the formula of household cleaning agents has lead to more concentration and stronger

Table 5. Physical examinations and white blood cell count.

Physical examinations	WBC Mean ± SD	*T*-test
Drowsy (n = 5)	11,760 ± 5,133	NS
Not drowsy (n = 68)	9,617 ± 3,249	
Drooling (n = 18)	12,000 ± 3,553	p = 0.003
Without drooling (n = 49)	8,975 ± 3,224	
Hoarseness (n = 14)	11,835 ± 4,914	p = 0.009
Without hoarseness (n = 58)	9,184 ± 2,712	
Stridor (n = 3)	13,666 ± 4,687	p = 0.043
Without stridor (n = 70)	9,595 ± 3,238	
Oral mucosal physical findings		
Lips		
Normal, hyperemia (n = 63)	9,664 ± 3,268	NS
Slough, superficial ulcer (n = 9)	11,014 ± 4,756	
Buccal		
Normal, hyperemia (n = 61)	9,210 ± 3,001	p = 0.004
Slough, superficial ulcer (n = 11)	12,790 ± 4,035	
Tongue		
Normal, hyperemia (n = 59)	9,154 ± 3,086	p = 0.004
Slough, superficial ulcer (n = 13)	12,469 ± 3,616	
Palate		
Normal, hyperemia (n = 64)	9,386 ± 3,182	p = 0.005
Slough, superficial ulcer (n = 7)	13,128 ± 4,092	

NS = Not significant (p > 0.05)

erosion. Strong alkali, such as caustic soda (sodium hydroxide) or drain cleaning liquid is not used widely. Fortunately, most Thai-households do not store this alkali agent. Other household cleaning liquids that contain benzalkonium chloride or ammonium cleaning agents may be used for floor cleaning. Detergents that contain sodium alkylbenzene sulphonate, sodium lauryl ethersulphate rarely cause severe injury and can be classified as mild corrosives. However, ingesting a larger amount of these agents can produce extensive injury[8]. Sodium hypochlorite, household bleach, is an oxidant and requires prolonged contact with mucous membranes to exert its corrosive effect. Commercially available preparations may contain surfactants in addition to sodium hypochlorite and are associated with a more powerful corrosive effect due to enhanced adhesion to mucous membranes.

I agree with the review on corrosive ingestion by Huge TB,1999, and Ogunleye AO,2002, that the reasons for corrosive ingestion in adults are mainly intentional[7,9]. In the present study, the major cause of ingestion was suicide which is precipitated by an intense crisis or acute stress. However, patients who deliberately self-harm have an adjustment disorder. I did not study corrosive ingestion in children, the major cause of which is by accident but is rarely the cause of death in adults. Because of the psychiatric problems of corrosive ingestion patients, the surgeon has to understand this and approach them with holistic care. The surgeon can provide a supportive role, especially in extensive injury patients who need prolonged management[7].

In the present study, most of the suicidal gesture patients ingested the corrosive substance at night, probably because that is when conflicts in the family are aggravated. Suicidal attempt and accidental events, however, can happen at any time.

Wu MH, 1993, recommended that the patients who met one of the associated criteria, including leukocytosis, blood gas analysis with a hydrogen value about 7.2, hemoglobinuria and respiratory distress, should undergo further evaluation and should be selectively considered for laparotomy[3]. Leukocytosis is a response of the body to inflammation, and I found strong statistical significance between leukocytosis and oropharyngeal injuries, and think that leukocytosis indicates more significant injury.

Several factors determine the degree of corrosive ingestion injury[7,10]. The most obvious are the type of agents, amounts, contact time and concentration[3-7,10-12]. From the author's experience, contact time is very difficult to evaluate. Most of the patients who ingested a diluted agent could not give details. Crain EF,1994, reported that the presence of

oropharyngeal burns did not identify patients with serious esophageal injury. He suggested that certain serious signs and symptoms-vomiting, drooling, and stridor-correlate with severe esophageal injury(11). From the present study, ingested volume estimation was highly significant statistically with symptoms of drooling and abdominal tenderness. While the type of agent was associated with the severity of the oral injury, stridor and hoarseness did not show any statistical significance associated with the amount and type of agent.

I found that all patients with stridor also had drooling and hoarseness. This is probably because the corrosive agent had passed the hypopharynx to the larynx and trachea.

The management of severe corrosive injuries remains controversial. Because of the unacceptable result of surgical reconstruction in oropharyngoesophageal injury, most surgeons decide to do permanent enteral feeding. But only some patients can accept this.

In conclusion, surgeons should pay attention to drooling and severity of oral burn which indicate the amount of ingestion and the type of agent. Oral mucosal slough or ulcer are associated with strong acid or alkali intake regardless of the volume of ingestion. If the patient has drooling, the surgeon should be aware that a large amount of agent has been ingested whatever the type.

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ลักษณะสำคัญทางคลินิกของผู้ป่วยกินสารกัดกร่อน

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วัตถุประสงค์ : ศึกษาอาการแสดงทางคลินิกหลังกินสารกัดกร่อน

สถานที่ทำการศึกษา : โรงพยาบาลมหาวิทยาลัย

รูปแบบการศึกษา : การศึกษาไปข้างหน้าเชิงพรรณนา

ประชากรที่ศึกษา : ผู้ป่วยกินสารกัดกร่อนระหว่างเดือนกรกฎาคม พ.ศ. 2543 ถึงเดือนธันวาคม พ.ศ. 2545 เหตุผลการกิน, อาการ, สิ่งที่ตรวจพบ และการตรวจพื้นฐานทางห้องปฏิบัติการ ถูกบันทึกลงไปแบบมาตรฐาน การวิเคราะห์ข้อมูลใช้สถิติเชิงพรรณนา

ผลการศึกษา : ผู้ป่วย 73 รายเป็นหญิง 55 ราย ชาย 18 ราย มัธยฐานอายุ 22 ปี 48 ราย (65.8%) กินกรดแก่ 3 ราย (4.1%) กินด่างแก่ การแสดงกริยาฆ่าตัวตายเป็นสาเหตุกินสารกัดกร่อนที่พบบ่อยที่สุด (89.2%) กลุ่มผู้ป่วยที่กินโดยมิได้ตั้งใจจะกินในปริมาณน้อยกว่า อาการคลื่นไส้อาเจียนน้ำลายสอและกดเจ็บที่หน้าท้องสัมพันธ์กับปริมาณที่กิน ขณะที่ความรุนแรงของการบาดเจ็บที่ริมฝีปาก กระพุ้งแก้ม เพดาน สัมพันธ์กับการกินสารกัดกร่อนชนิดรุนแรงอย่างมีนัยสำคัญทางสถิติ ($p < 0.05$) เม็ดเลือดขาวสูงในผู้ป่วยที่มีอาการน้ำลายสอ เสียงแหบ หายใจเสียงดัง เยื่อบุช่องปากลอก หรือเป็นแผลตื้น ($p < 0.05$) 4 รายได้รับการผ่าตัด 2 รายตัดหลอดอาหารและกระเพาะ ผู้ป่วย 21 รายได้รับการติดตาม เฉลี่ยระยะเวลา 11 เดือน (1–28 เดือน) 1 รายตายจากภูมิคุ้มกันบกพร่อง ที่เหลือสบายดี

บทสรุป : อาการน้ำลายสอ เยื่อบุช่องปากหลุดลอก หรือ แผล มีความสำคัญ ซึ่งสัมพันธ์กับปริมาณที่กิน และกินสารกัดกร่อนชนิดรุนแรง ตามลำดับ เพื่อการดูแลแบบองค์รวมต้องให้ความสำคัญการรักษาทางจิตใจ และศัลยแพทย์ควรจะมีบทบาทในการช่วยเหลือนี้

คำสำคัญ : กินสารกัดกร่อน, การบาดเจ็บจากสารกัดกร่อน, อาการแสดงทางคลินิก, ฆ่าตัวตาย, การปรับตัวที่ผิดปกติ, ระบาดวิทยา

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