

## Acute Corrosive Esophago-Gastritis

— A Case of Drain-cleansing Liquid-induced Transmural Inflammation —

Tae Jin Kim, M.D., Jeong Wook Seo, M.D. and Yong IL Kim, M.D.

*Department of Pathology, College of Medicine, Seoul National University*

### ABSTRACT

The pathologic features of acute corrosive esophago-gastritis by ingestion of "Trapunc", a common commercial drain cleansing liquid, is presented. A 37-year-old woman ingested about 30 ml of Trapunc (3 gm NaOH/100 ml) to commit suicide and received piecemeal esophagectomy and total gastrectomy 9 days after the episode. The esophagus and stomach were extremely friable and necrotic. The most part of the stomach showed acute toxic necrotizing gastritis which was manifested by extensive greenish brown discoloration due to liquefaction necrosis of the mucosa except for a few rugae along the greater curvature. The antrum and distal body revealed severe mucosal detachment and even transmural necrosis. The tissue reaction was basically the same as those of NaOH-induced corrosive esophago-gastritis of acute stage, although it appeared to be severer probably due to sodium hypochlorite, an additive constituent of the ingested cleanser. A unique distribution pattern of mucosal involvement is discussed.

**Key Words:** Corrosive esophago-gastritis, Drain Cleanser, lye

### INTRODUCTION

Ingestion of strong alkali or acid may lead to gastric as well as esophageal injury, but reports on the pathologic features of corrosive gastritis are rare in the literature as compared to those of corrosive esophagitis, perhaps because esophageal injuries are more serious and divert attention from the gastric injury. Caustic burns occur in children by accidents and in adults usually by ingestion for suicidal attempts. In particular, awareness of the historical changing pattern of lye preparations is of worthy with regard to their tissue reactions in this country. Lye crystals, especially liquid preparations for drain cleansing, which are the most common cause of corrosive esophago-gastritis in the USA,

become a current usage in Korea since 1984. We report a case of gastric and esophageal insult caused by Trapunc (a commercial name of drain cleansing liquid) ingestion in view of its particular involvement pattern.

### CASE REPORT

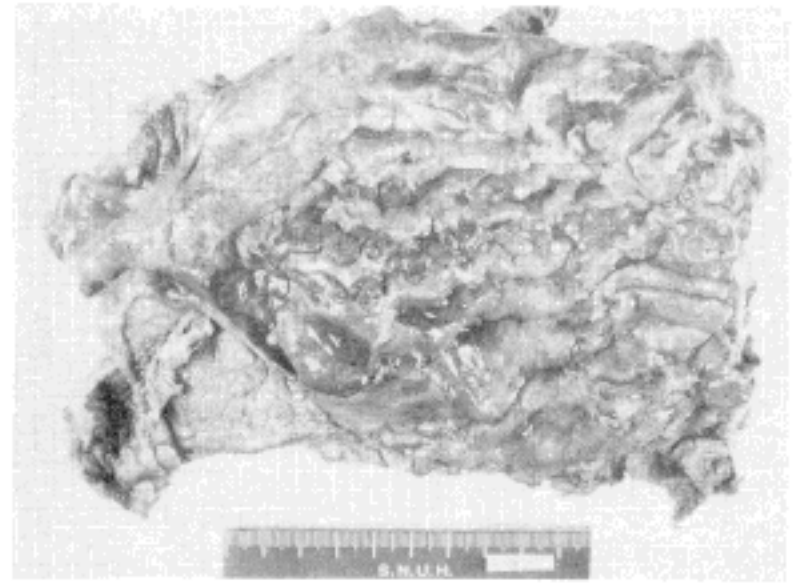
A 37-year-old woman ingested about 30 cc of "Trapunc", a commercially available lye preparation for drain cleansing, to commit suicide on March 22, 1989. The patient was brought to a private clinic, where she was initially managed conservatively for 9 days under the impression of esophageal rupture, but no clinical improvement was assured. On March 31, she was transferred to the hospital and underwent an emergency operation. During total piecemeal esophagectomy, the paraesophageal tissues including lungs and mediastinum were found to be

\*This abstract was presented at the 41th Fall Meeting of the Korean Society of Pathologists, October, 1989.

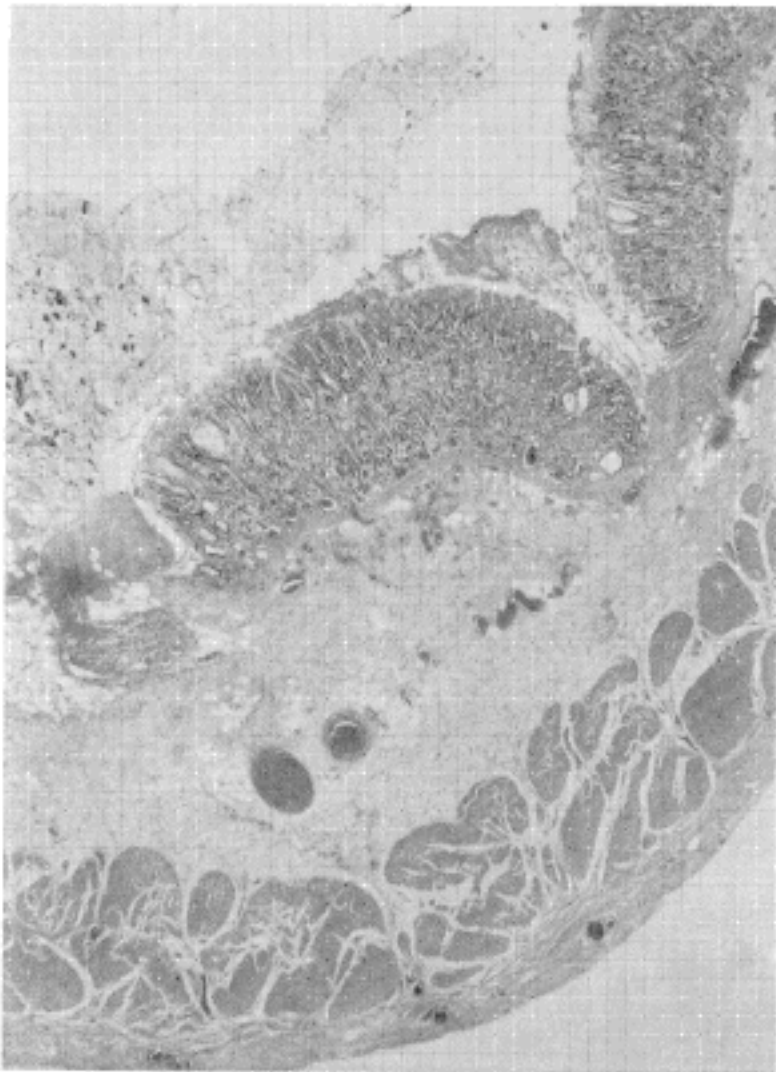
involved by the inflammatory process. A foul-odored dirty green material (thought to be a damaged gastric mucosal tissue) sloughed from the distal portion of the stomach end, eventually requiring total gastrectomy and feeding jejunostomy. The adjacent hepatic surface was discolored by the neighboring stomach lesion. She underwent a colonic bypass surgery by which immediate clinical improvement followed. She remains well till ten months after surgery.

### PATHOLOGIC FINDINGS

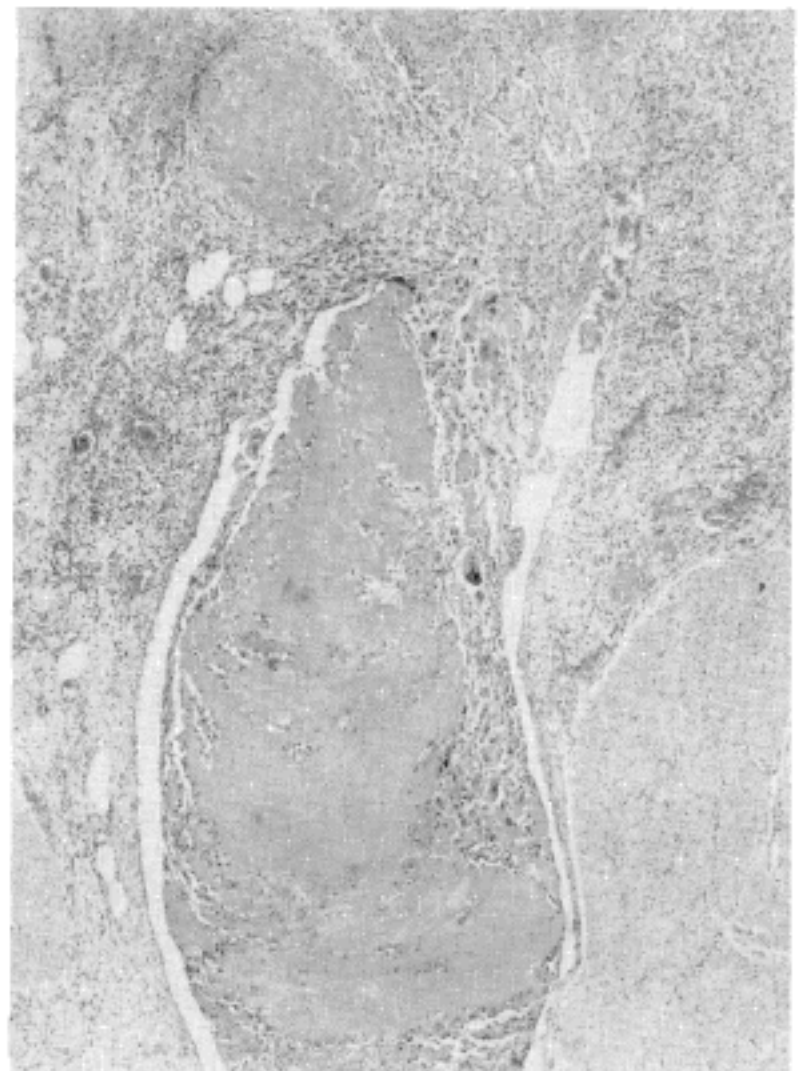
The submitted esophageal tissue fragments were near-totally necrotic and friable, showing pinkish



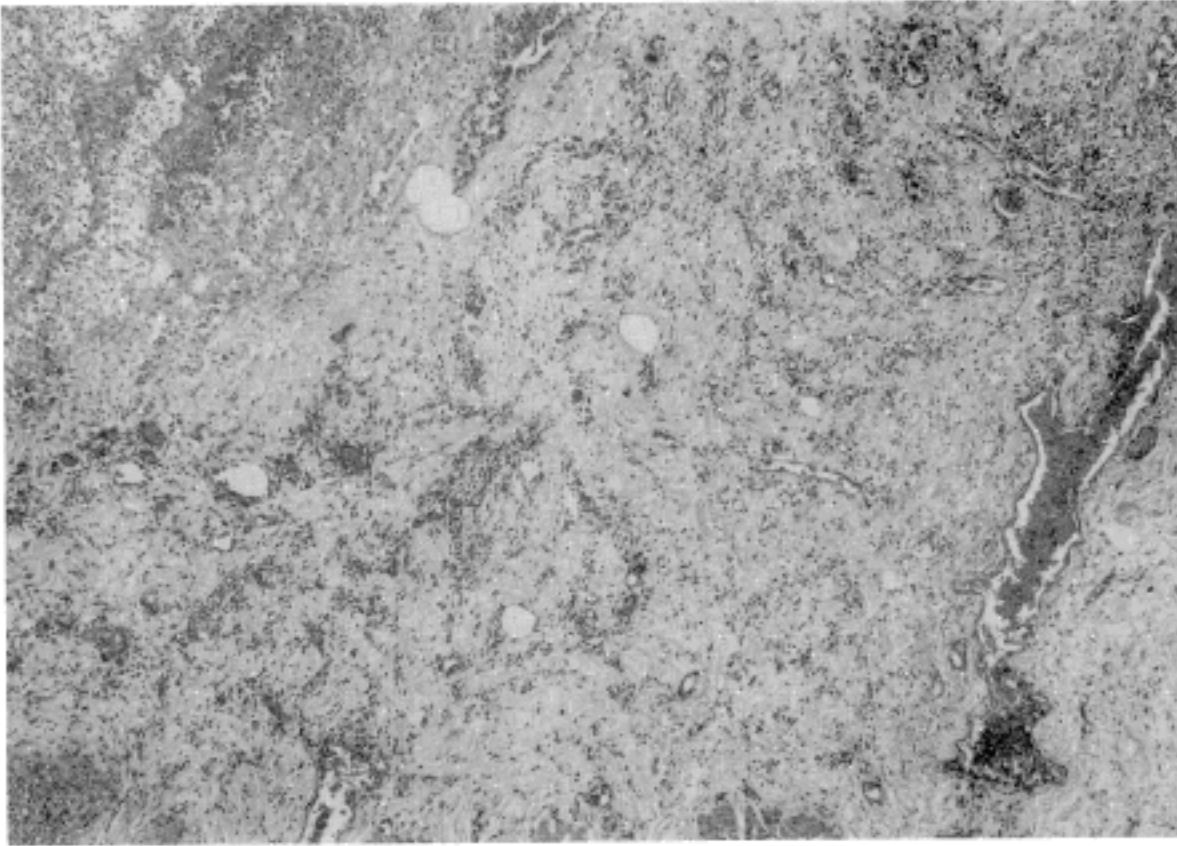
**Fig. 1.** The resected stomach reveals extensive necrosis and greenish discoloration of the mucosa involving the near-total gastric wall. A few gastric rugae along the greater curvature remain free of necrosis. The antrum is the site of extensive mucosal denudation and detachment.



**Fig. 2.** Photomicrograph of the affected gastric wall. Left upper corner discloses a mucosal liquefaction necrosis. The remaining mucosa is relatively well preserved. The submucosa is widened and reveals marked telangiectasia. (H & E,  $\times 10$ )



**Fig. 3.** The submucosal veins are dilated and plugged with recent thrombi. (H & E,  $\times 40$ )



**Fig. 4.** The submucosa shows active granulation tissue formation. (H & E,  $\times 40$ )



**Fig. 5.** The serosa in the antrum shows chronic active inflammation. (H & E,  $\times 40$ )

white discoloration of the mucosa. The resected stomach disclosed extensive necrosis and greenish brown discoloration of the mucosa, involving the near-total gastric wall except for a few rugae along the greater curvature where islands of intact mucosa stood out (Fig. 1). It smelled a very foul odor. The antrum was the site of extensive mucosal denudation

and detachment. Serosal surface revealed two ovoid areas of transmural necrosis at the body portion of both anterior and posterior walls. Microscopically, the mucosa and submucosa underwent extensive liquefaction necrosis together with saponification of the fat tissue (Fig. 2). The submucosal-subserosal veins were markedly dilated and plugged with recent

thrombi (Fig.3). Foreign body-type giant cell reaction was accompanied especially beneath the ulcerated mucosa. Early granulation tissue appeared in the submucosa and inner muscle layer (Fig. 4). In areas, transmural inflammatory involvement of the gastric wall led to serositis (Fig. 5).

## DISCUSSION

The ingested corrosive substance was a lye preparation ("Trapunc"), the constituent of which included 3% sodium hydroxide (NaOH), 2% sodium hypochlorite (NaClO) and some surfactant. The total amount of NaOH the patient ingested was estimated 0.9 gm NaOH, being sufficient enough to induce a corrosive change of the esophageal and gastric mucosa.

Current rapid modernization has changed the pattern of life style so as in the method of committing suicide. In the past, crude NaOH or KOH used to be the household lye for cleansing of suit came to be the subject of accidental or suicidal ingestion<sup>1)</sup>, but recent development of a concentrated sodium hydroxide drain cleanser posed a new problem. Lye crystals, and especially liquid preparations for drain cleansing, are the most common cause of corrosive esophagitis in the USA, but in this country, no such cases due to the ingestion of this kind of drain cleanser have been documented. Historically, ingestion of toxic substance has shifted from household lye (before 1960s), to barbiturate, quinine, rodenticide such as RH-787 (N-3-pyridyl methyl-N'-nitrophenylurea) and Pratul (sodium fluoride) and organophosphate insecticide including paraquat (1970s-1980s) in Korea<sup>2-6)</sup>. The active ingredient of liquid drain cleansers, which are commonly used in USA, is 0.5 to 32.0 per cent sodium hydroxide with or without sodium hypochlorite. The injuries caused by these appear to be much more severe than in the lye ingestion. Even ingestion of a few drops from an apparently empty bottle of Liquid-plumber (a com-

mercial name in USA) by a 2-year-old girl resulted in progressive dysphagia several weeks later and necessitated a colonic bypass of the esophagus<sup>6)</sup>.

The severity and pattern of damage by corrosives are influenced by nature of the corrosives (alkali or acid, liquid or solid), amount, concentration and additives, aside from gastric state at the time of ingestion<sup>7,8)</sup>. Acid gravitates to the stomach along the lesser curvature (so-called Magenstrasse), giving more extensive damage in the stomach than in the esophagus. On reaching the antrum, passage of the acid is delayed by strong spasm<sup>9)</sup>, and thus, the principal sites of damage are the gastric antrum and pylorus<sup>10)</sup>. In contrast, alkali initially burns the lips, tongue, and pharynx. Especially, the solid forms such as granular drain cleansers damage the more upper aerodigestive tract than the liquid forms<sup>11)</sup>. In our case, the esophagus was involved transmurally, while the stomach showed diffuse liquefaction necrosis confined to the mucosa and submucosa except those along the greater curvature, and the muscle layers were less severely affected, although focal transmural involvement and serositis were encountered in the distal stomach. Such a difference of intensity by sites corresponds to the fact that Trapunc is a strong alkali liquid, by which the esophagus is more severely involved than the stomach. Moreover, the gastric involvement in our case was so severe to necessitate a gastric resection probably because of a very large dose of ingestion in an empty stomach. In a full stomach, the gastric contents dilute the corrosive, and most of the stomach tissue is protected by them. However, in the empty stomach which is usual for suicidal patients, more extensive gastric involvement is expected in the distal portion of the stomach<sup>12)</sup>.

Acid produces a coagulation necrosis and an overlying protective eschar as in a thermal burn, whereas alkali produces a liquefactive necrosis marked by liquefaction of the underlying fat cells and its enhanced penetration. Therefore, injuries involving the

full thickness commonly result<sup>7)</sup>.

The sodium hypochlorite (an alkaline compound used as a bleaching agent etc.) included in "Trapunc" is also thought to contribute to the gastric injury; it decomposes in the stomach by releasing oxygen and may cause gastritis. It has been known that sodium hypochlorite forms hydrochlorous acid and nascent oxygen which are potent oxidizing agents producing cellular injury<sup>13)</sup>. Therefore, we assume that a complex mechanisms may contribute to the profound antral involvement in this case; pyloric spasm by exposure to sodium hydroxide in empty stomach and additive effect of sodium hypochlorite.

### REFERENCES

- 1) Ahn JH, Kim JH: *Benign esophageal stricture. Kor J Thorac Cardiovasc Surg* 21:1052-1059, 1988
- 2) Lee DJ, Kim HC, Kim YC, Kim ST: *Statistical observations of acute drug intoxications. New Med J* 9:45-52, 1966
- 3) Lee TH, Kim YS, Chung MY, Park YK, Jung NK: *Clinical prospective study of RH 787 intoxication in human. Kor J Int Med* 20:530-537, 1977
- 4) Yun DH, Woo SH, Kwon YO, Lee KL, Baek JH, Lee CJ, Tae KH, Kang JY, Moon YJ: *Clinical studies on Pratol intoxications. Kor J Int Med* 28: 97-102, 1984
- 5) Yoon KL, Lee JT, Hwang IW, Seo JD, Lee BH: *Clinical observation on organophosphate insecticide intoxication. Kor J Int Med* 19:779-786, 1976
- 6) Leape LL, Ascraft KW, Scapelli DG, Holder TM: *Hazard to health liquid lye. N Engl J Med* 284:578-581, 1971
- 7) Kirsh MM, Ritter F: *Caustic ingestion and subsequent damage to the oropharyngeal and digestive passages. Ann Thorac Surg* 21:74-82, 1976
- 8) Lowe JE, Graham DY, Boisauvin EV, Lanze FL:

*Corrosive injury to the stomach. The natural history and role of fiberoptic endoscopy. Am J Surg* 137: 803-806, 1979

- 9) Levitt RL, Stanley RJ, Wise L: *Gastric bullae. An early roentgen finding in corrosive gastritis following alkali ingestion. Radiology* 115:597-598, 1975
- 10) Gimmon A, Durst AL: *Acid corrosive gastritis. A plea for delayed surgical approach. Am J Surg* 141: 381-383, 1981
- 11) Johns TT, Thoeni RF: *Severe corrosive gastritis related to Drano. An unusual case. Gastrointest Radiol* 8:25-28, 1983
- 12) Ragheb MI, Ramaden AA, Khalil MA: *Corrosive gastritis. Am J Surg* 134:343-345, 1977
- 13) Ellenhorn MJ, Barcelux DG: *Medical toxicology. diagnosis and treatment and human poisoning. 1988. Elsevier, New York, 903-933*

### == 국문초록 ==

#### 급성 부식성 식도-위염

— 액성 하수구 청정제에 의한 경벽성 염증례 보고 —

서울대학교 의과대학 병리학교실

김태진 · 서정욱 · 김용일

액성 하수구 청정 용제인 "트래핑"의 연하로 인한 부식성 식도-위염 1예의 병리학적 소견을 보고한다. 37세 여자가 자살 목적으로 "트래핑"을 약 30 ml(0.9 gm NaOH 함유)를 연하하여 내과적으로 치료받다가 호전되지 않아 9일 후 식도 및 위절제술이 시행되었다. 식도는 심한 괴사를 보였고 부서지기 쉬웠다. 대만곡상의 일부 선상 부위를 제외한 전 위벽에서 녹갈색의 괴사성 점막이 관찰되었고 유문부에서는 광범위한 점막 박리가 있었다. 장막면에 이르는 두 개의 경벽성 괴사가 체부 하단에 보였다. 현미경적으로 급성 괴사성 식도-위염이 주 소견이었고 기본적으로 NaOH에 의한 급성기의 부식성 식도-위염과 동일하였으나 첨가제(sodium hypochlorite)의 촉진적 역할에 의하여 더욱 고조된 것으로 사료된다. 유문동 침범을 주로하는 특징적인 점막 침범의 분포 기전을 문헌고찰과 아울러 논의하였다.