

Esophagogastroduodenoscopy and Endoscopic Classification in Diagnosis, Treatment and Prognosis of Patients with Acute Caustic Poisonings

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Original paper SUMMARY

The aim of this paper was to present the importance of esophagogastroduodenoscopy in the rapid diagnosis and adequate treatment, outcome and prognosis of patients with caustic ingestion. Oral poisoning with caustic substances occurs by an ingestion of acids, alkalis, heavy metal salts, formalin, iodine tincture and many other chemical substances. Esophagogastroduodenoscopy is a sophisticated and sovereign method for diagnostic evaluation of acute corrosive poisonings and injuries of the upper part of gastrointestinal tract. According to the latest controlled studies the most optimal timing for esophagogastroduodenoscopy is the first 12 – 24 hours after the corrosive ingestion.

Some authors suggest that upper endoscopy may be safely performed at least in the first 96 hours after the caustic ingestion. Our examined group consisted of 37 patients, 9 (24.3%) males and 28 (75.7%) females. The age of the patients ranged from 42.9 ± 16.5 years, \pm confidence from 37.3 to 48.4 years; the youngest age category being 14 and the oldest 75 years. Poisoning with suicidal intent was registered in 35 (94.6%) and poisoning by accident in 2 (5.4%) patients. Analysis of the difference in the endoscopic control of the esophagus, related to its injuries at admission and discharge, for $Z=5.3$ and $p<0.001$ showed a significant difference. It showed greater number of patients with normal findings during the endoscopic control, which is due to the used therapy.

Beside of the gastric improvement, for $Z=1.3$ and $p>0.05$, difference in the results (admission and discharge) didn't show a significant difference. Caustic poisonings are an economic burden for the health care system because of the expensive treatment and moreover, post-corrosive injuries may cause a serious invalidity in these patients. Emergency endoscopy has proved to be a sovereign diagnostic procedure for determination of the grade and extent of post-corrosive lesions. The established changes correlate with the diagnostically confirmed severity of the poisoning, treatment and therapy as well as with eventual onset of late complications.

Key words: caustic poisonings, esophagogastroduodenoscopy, esophageal caustic injuries

1. INTRODUCTION

Oral poisoning with caustic substances occurs by an ingestion of acids (hydrochloric, acetic, sulfuric, oxalic, carbolic), alkalis (sodium and potassium, soaps, detergents), heavy metal salts, formalin, iodine tincture and many other chemical substances (1,2).

Severity of the chemical burns that affect the entire gastrointestinal tract depends on several factors: nature, quantity and concentration of the ingested corrosive substance, duration of exposure

and the act of swallowing (3).

The route of the corrosive agent through the gastrointestinal tract causes extensive damages in the oral cavity, throat, esophagus, stomach, and duodenum (4,5). The final outcome of acid ingestion is the so-called coagulation necrosis whereas alkali ingestion results in liquefaction necrosis (6,7).

Esophagogastroduodenoscopy is a sophisticated and sovereign method for diagnostic evaluation of acute corrosive poisonings and injuries to the upper part

of gastrointestinal tract (8). According to the latest controlled studies the most optimal timing for esophagogastroduodenoscopy is the first 12 – 24 hours after corrosive ingestion (9). Some authors suggest that upper endoscopy may be safely performed at least in the first 96 hours after the caustic ingestion. Since the healing process of the post-corrosive injuries begins on the 4th day and is most intensive until the 14th day, it is suggested to avoid this diagnostic procedure.

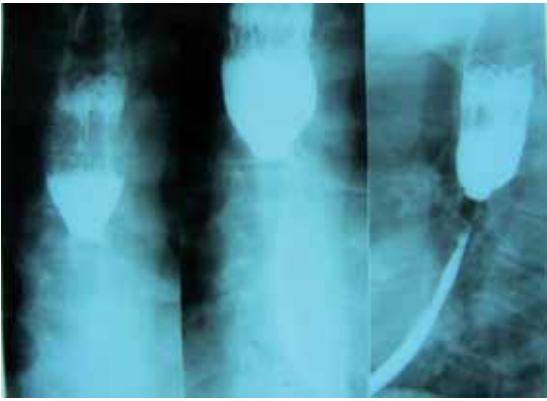


Figure 1. X-ray finding of narrowed mid- and distal esophagus and dilated proximal esophagus



Figure 2. X-ray finding of an esophagus after retrograde intraluminal dilation

Endoscopic classification of post-corrosive lesions of the upper part of gastrointestinal tract is of enormous significance in diagnosis and treatment of acute corrosive poisonings. There are several classifications: Kikendall's (classification in four grades); Holinger and Fridman's (in three grades); Zargar's (in seven grades).

Esophagogastroduodenoscopy gives us important data on post-corrosive changes and damages in the upper GIT (esophagus, stomach, duodenum), which provide a thorough evaluation during clinical examinations, treatment and prognosis of patients (11).

The aim of this paper was to present the importance of esophagogastroduodenoscopy in the rapid diagnosis and adequate treatment, outcome and prognosis of patients with caustic ingestion.

2. MATERIAL AND METHODS

This is a retrospective study

comprising 37 patients of both sexes (28 females and 9 males), from 14 to 75 years old, who ingested caustic substances by accident or with suicidal intention. The patients were clinically examined at the University Clinic of Toxicology in Skopje.

The evaluation of the caustic poisonings was done on the basis of anamnesis and hetero-anamnesis for intentional or accidental poisoning, physical examination of the patient and observation of the local changes in the oral mucosa, tongue, palate and throat, mode and motive for poisoning (suicidal or accidental), type of the chemical structure of the ingested corrosive agent (organic or inorganic acids, alkali and other corrosive substances),

quantity of the ingested corrosive agent.

The protocol for examination included determination of the parameters on admission of the patient to our hospital, during his stay and on discharge.

Visualization was done with esophagogastroduodenoscopy in the first 12-24 hours after admission to the hospital, 15 and 25 days after admission conducting control esophagogastroduodenoscopy.

For classification of the endoscopic findings the scale recommended by Kikendal was used:

- First grade: erythema and edema of the mucosa;
- Second (a) grade: erosions, blisters, superficial ulcers (transversal and linear), exudation, hemorrhage;
- Second (b) grade: circumferential lesions;
- Third grade: multiple deep brownish-black or grey ulcerations and necrosis;
- Fourth grade: perforation.

3. RESULTS

The examined group consisted of 37 patients, 9 (23.4%) males and 28 (75.7%) females. The age of the patients ranged from 42.9 ± 16.5, ± 95.000 confidence of 37.3 to 48.4 years; the youngest age category being 14 and the oldest 75 years. In 35 (94.6%) patients, poisoning with suicidal intention was registered, whereas in 2 (5.4%) it was accidental. With reference to the ingested corrosive substance, patients (n=28 -75.7%) who ingested hydrochloric acid predominated, followed by those(n= 6 -16,2%) who ingested acetic acid , and (n=3-8,1%) sodium hydroxide.

The quantity of ingested corrosive substance varied from 15 ± 9.7 ml, ± 95.000 confidence interval from 11.8 ml. to 18.2 ml, minimum amount being 5 ml and maximum 50 ml.

Emergency esophagogastroduodenoscopy was made in all patients on admission. The results of the esophageal examination on admission show that post-cor-



Figure 3. X-ray finding of stenosis of pylorus

rosive injuries of grade II B were registered in (n= 13 ,35.1%) patients, post-corrosive injuries of grade III in 20 (54%), post-corrosive injuries of grade II A in (n=3 ,8.1%), and post-corrosive injuries of grade I in one patient only (n= 1 ,2.7%).

In the discharge results for the esophagus normal finding predominated in 28 (75.7%) patients; some superficial changes associated with hyperemia and edema were registered in 7 (18.9%) and stenosis of the distal part of the esophagus in 2 (5.4%) patients (Table 1).

The results of the gastric examinations made on admission show that post-corrosive grade II B lesions were registered in (n=19 ;51.4%) patients, post-corrosive grade III lesions in (n=12 ; 32.4%), grade II A lesions in (n=3 ;8.1%) and grade I lesions in (n= 3 ;8.1%) patients

The results of the gastric examination show that the largest number of patients (n=16; 43.2%) had a normal finding, hyperemia and edema to a certain degree was still present in (n=16; 43.2%) patients, stenosis of the antrum and corpus in(n=2; 5.4%) , and stenosis of pylorus was registered in (n=1 ;2.7%) patient.

Analysis of the difference in the endoscopic control of esophagus at admission and control, for Z=5.3 and p<0.001(Sig.) showed a significant difference. Normal findings predominated which is probably due to the used therapy.

The difference in the endoscopic gastric examination showed greater number of patients with normal findings. Despite of the evidenced results, and changed distribution of the findings, for Z=1.3 and p>0.05(N.Sig.), the difference in the analysis at admission and control wasn't significant. (Table 1)

A successful retrograde intraluminal dilatation of the esophagus was realized in two patients and six patients were surgically treated because of the post-corrosive stenotic changes of the stomach. There were no lethal outcomes.

4. DISCUSSION

The incidence of caustic poisonings in the world is increasing. (13,14). In 2003 the American Association of Poison Control Centers reported 145394 caustic poisonings with different caustic agents where poisoning with alkali and cleansing-alkaline-based-agents were prevailing (15). On the other hand, acids, hydrochloric (HCl) and acetic acid (CH₃COOH) are prevailing ingested caustic substances in our country. It is noteworthy that acute corrosive poisonings constitute 8-10% of the total number of poisonings, 18-80% of the complications and 10-38% of the mortality(16). The data for our country show incidence of 15-18% of the total number of poisonings, 14-40% of the complications, and 3-5% of the mortality (17).

Esophagogastroduodenoscopy is a sophisticated and sovereign method for diagnostic evaluation

of acute corrosive poisonings and lesions of the upper gastrointestinal tract (18). According to the latest controlled studies the most optimal timing for esophagogastroduodenoscopy is the first 12 – 24 hours after corrosive ingestion (19). Some authors suggest that upper endoscopy may be safely performed at least in the first 96 hours after the caustic ingestion. Since the healing process of the post-corrosive injuries begins on the 4th day and is most intensive until the 14th day, it is suggested to avoid this diagnostic procedure (20). Making a decision on emergency esophagogastroduodenoscopy depends on several factors:

- type of the corrosive substance,
- its quantity,
- the intention of ingestion of the corrosive substance, and
- onset of symptoms following the ingestion.

The latest researches suggest

Esophagus (admission diagnosis/ final discharge diagnosis)				
Finding admission Total	Number		%	
I grade	1	2,7	1	
II A grade	3	8,1	3	
II B grade	13	35,1	13	
III grade	20	54	20	
Finding/ final discharge				
Normal finding	28	75,7		
Hyperemia and edema	7	18,9		
Stenosis of the distal part	2	5,4		2
Stomach(admission diagnosis final/ discharge diagnosis)				
I grade	3	8,1		3
II A grade	3	8,1		3
II B grade	19	51,4		19
III grade	12	32,4		12
Finding/final discharge				
Normal finding	16	43,2		16
Hyperemia and edema	11	29,7		11
Stenosis of antrum and corpus	2	5,4		2
Pyloric stenosis	1	2,7		2
Stenosis of antrum, corpus and pylorus	7	18,9		7
Esophagus (Z=5.302; p-level=0.000000; p<0.001; Sig)				
Stomach (Z=1.136; p-level=0.255; p>0.05; N.sig)				

Table 1. Esophagus (admission diagnosis/ final discharge diagnosis Esophagus (Z=5.302; p-level=0.000000; p<0.001; Sig) Stomach (Z=1.136; p-level=0.255; p>0.05; N.sig)

an eventual urgent upper endoscopy to be carried out after previous sedation, general anesthesia and endotracheal intubation of the patient (22).

Hypopharyngeal burns of third degree are an absolute contraindication for esophagogastroduodenoscopy (22). The most severe complication is iatrogenic perforation, which fortunately is very rare; however, when this invasive method is performed, one must have this complication on mind.

In all of our patients emergency esophagogastroduodenoscopy was done in the first 12-36 hours after ingestion depending on the general condition of the patients and possible assumed injuries that might seriously jeopardize the examination.

Esophagogastroduodenoscopy gives us useful data on the location and extent of the post-corrosive damages, severity and classification degree, which are of huge importance for the further treatment of the patients.

Endoscopic classification of post-corrosive injuries in the upper part of gastrointestinal tract is of enormous significance in diagnosis and treatment of patients with acute corrosive poisonings. We have used the five-grade-classification suggested by Kikendal because we thought that it would give us as many data as possible about the post-corrosive damages to the upper gastrointestinal tract in our patients.

The injuries in the mouth, throat, esophagus, stomach and duodenum can be either reversible or irreversible. The damaged mucosa, submucosa and muscle layer regenerate with great difficulty because of the surrounding inflammation, necrosis and secondary complications. Fibrosis, organization of the tissues and adhesions or circular stenosis appear, which greatly disturb the normal functioning (impeded peristaltic, impeded passage) (19). Post-corrosive grade I injury usually does not need therapy, except a 24-hour observation. In grade II A injuries, beside antibiotic therapy,

vitamin and symptomatic therapy is administered for 10 days and a specially prepared "food-tube" that the patient takes per os.

In patients with grade II B and III injuries, antibiotics and corticosteroids are concomitantly given (although corticosteroid administration has raised various opinions worldwide). Also, a special regime of nutrition in a period of 10 to 12 days with the so-called esophageal rest is maintained when patients are given either a complete parenteral nutrition in peripheral and central vein or enteral nutrition through inserted nasogastric or jejunal tube or enterostoma.

Twenty-two of our patients were given enteral nutrition by tubes and enterostomas and 15 were given a complete parenteral nutrition.

All of our patients received the standard therapy, which is being practiced in caustic substance poisonings:

- antibiotic therapy (most commonly with penicillin or cephalosporin)
- nutritional support
- symptomatic therapy (20)

In one study a group of 430 patients who ingested corrosive substances either by accident or by suicidal intention, were included. In the rapid diagnosis and prevention of fatal complications such as perforation, they recommend emergent esophagogastroduodenoscopy and treatment with high doses of corticosteroids. However, in spite of this therapeutic approach, they have reported a high percentage of complications (40%). This kind of treatment and prevention of strictures has no sufficient support in other controlled studies. (21)

In another study 58 patients were included, and they ingested corrosive substances with suicidal intention. They recommend emergent esophagogastroduodenoscopy and depending on the finding, an early surgery and resection of the affected GIT segments. This would prevent post-corrosive stenosis and eventual neoplastic strictures (22).

Determination of distribution and extent of post-corrosive injuries of upper GIT was the aim of the study conducted in a 6-year-period monitoring 158 patients at the age from 14 to 97 years. Of these, 84 (53%) patients ingested lye, 21 (13%) alkali acid, 43 (27%) various caustic agents and 10 (6%) patients unknown caustic chemical substance. Applying upper endoscopy, grade II B and grade III injuries were observed in 33 (21%) and 20 (13%) patients, respectively (23). The remaining patients were with grade I injury and with no evident changes in the esophagus and stomach. Of the 158 patients, 91 (57.5%) had gastric injuries, 72 (45.5%) esophageal injuries and 28 (18%) patients had duodenal injuries. Caustic agent was accidentally ingested by 80 (51%) patients, 62 (39%) patients had suicidal attempt and 16 (10%) patients ingested it by unknown reason. In the acute phase, 8 (5%) patients died and 10 (6.3%) needed urgent surgical intervention. In 66% of the patients there were late post-corrosive complications (stenosis of esophagus and stomach) (24).

Intensity and mucous damage of the upper GIT in caustic poisonings, which are documented after the emergency esophagogastroduodenoscopy is of huge importance in decision making on the therapeutic approach. The majority of authors think that hyper-alimentation (enteral or parenteral) and antibiotic therapy have the biggest effect in the successful healing. In contrast to post-corrosive injuries of grade I and II A that usually do not develop post-corrosive complications, 50-70% of patients with grade II B injury develop stenosis in the first 6 months after ingestion and all (100%) of patients with grade III injury (25).

Analysis of the medical records of 116 patients with caustic ingestions showed that most of the patients were at the age of 40 years, 84.48% ingested alkali; predominant symptoms were dysphagia, retrosternal pain and weight loss; and stenosis appeared in 65.5%

of all patients 30 days after ingestion, which was proved by endoscopic and x-ray examinations (26).

In spite of the good screening results and modern treatment of patients with acute corrosive poisonings, the American Society of Gastrointestinal Endoscopy (ASGE) gives several recommendations for monitoring of patients with caustic injuries to upper gastrointestinal tract:

- surveillance of patients 15 to 20 years after corrosive ingestion;
- endoscopic examination every three years;
- reduction of the threshold for evaluation of dysphagia (27). Prognosis in acute corrosive poisonings is variable and depends on the degree of esophageal and gastric injury, as well as on the general health condition of the patient. The highest mortality rate has been recorded as a consequence of perforation and mediastinitis.

5. CONCLUSION

Emergency endoscopy has proved to be a sovereign diagnostic procedure for determination of the grade and extent of post-corrosive lesions. The established changes correlate with the diagnostically confirmed severity of the poisoning, treatment and therapy as well as with eventual onset of late complications.

Emergency endoscopy is a sovereign diagnostic procedure for patient selection. In each patient with grade II B and III injury according to Kikendal, the treatment is long-lasting; a more extensive and diverse therapy is applied; therapeutic management usually begins or ends with emergent surgery, retrograde intraluminal dilatation or esophageal stent; unfortunately, patients often die.

It is evident that emergency esophagogastroduodenoscopy has a great prognostic importance in acute caustic poisonings.

REFERENCES

1. Bozinovska C. Xenotic changes in acute corrosive intoxications. Archives of Toxicology, Kinetics and Xenobiotic Metabolism, 1998; 3:115-7.
2. Baskin D, Urganci N, Alkim C. A standardised for the management of corrosive ingestion in children. *Pediatr Surg Int*, 2004 Dec;11-12: 824-8.
3. Deskin R. Caustic ingestion. com [homepage on the Internet]. U TMB, Grand Rounds Dept. of Otolaryngology; 1995 [updated 2001 april 17; cited 2010 june 30]. Available from: www.utmb.edu/otoref/grnd/Aerodigestive-Tract-2001-04.htm
4. Zabelegui A, Mijan de la Torre. Severe gastroesophageal lesions due to caustics; the role of nutritional support. *Nutr Hosp*, 1995 Nov-Dec; 6:364-7.
5. Zhou JH, Jiawg YG, Lin YD, Menagement of corrosive esophageal burns in 149 cases, *J Thorac Cardiovascular Surg*, 2005 Aug; 130 (2): 449-55 (206).
6. Ochi K, Ohashi T, Sato S, Witarai J, Maeda C, Takeyama I, Surgical treatment for caustic ingestion injury of the pharynx, larynx and esophagus; *Acta Otolaryngol Supl*; 1996; 522; 116-9.
7. Alinejad A. Caustic injury to upper gastrointestinal tract. com [homepage on the Internet]. Shiraz university of medical sciences, Department of internal medicine, 2000 [updated 2000; cited june 2010] Available from: pearl.sums.ac.ir/semj/vol4/jan2003/causticinj.htm
8. Kikendal JW. Caustic ingestion injuries. *Gastroenterol Clin North Am*, 1991; 4:847-57.
9. Zargar SA, Kuchhar R, Mehta S, et al. The role of fibroptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc*, 1991; 37:165-9.
10. Abakumov MM, Kostiuchenko LN, Kudrichoba NE. Enteral infusion-nutritional correction of homeostasis in patients with postburn cicatricial stenosis of the esophagus and stomach. *Vestn Khir Im II Grek*, 1999; 5: 30-30.
11. Holinger LD. Management of Sharp and Penetrating Foreign Bodies of the Upper Aerodigestive Tract. *Annals Otol Rhinol Laryngol*, 1990; 99: 684-8.
12. Mamede RC, De Mello Ficho FV. Treatment of caustic ingestion: an analysis of 239 cases, *Dis esophagus*, 2002; 3:210-3-
13. Kardon E. Caustic ingestion, com [homepage on the Internet]. Emergency Medicine Toxicology. [updated 2010 may ; cited june 2010]. Available from: medicine.medscape.com
14. Ramasamy K, Gumaste VV. Corrosive ingestion in adults. *J Clin Gastroenterol*, 2003 Aug; 2: 119-24.
15. Triadafilopulos G. Caustic esophageal injury in adults. com [homepage on the Internet]. [Updated June 2006; cited june 2010]. Available from: www.informapharmascience.com.
16. Chibishev A, Chibisheva B, Bozinovska C, Naumovski J. Oesophageal and gastric stenoses are common complications after acute oral poisoning with corrosive agents. *Macedonian J of Med*, 2005; 1-2:139-46.
17. Zwischenberger Joseph B, Clare S, Bidan A. Surgical Aspects of Esophageal Disease. *Am J Respir Crit Care Med*, April 2002; 8: 1037-40.
18. Gupta SK, Croffie JM, Fitzgerald JF. Is Esophagogastroduodenoscopy necessary in all caustic ingestions? *J Pediatr Gastroenterol Nutr*, 2001; 32:50-53.
19. Soderman AC, Personne M, Ingestion of caustic agents-esophagogastrosocopy guides the therapy-lakartioningen; 2005 Jul 25 Aug; 102(30-31):2136-40.
20. Christesen HB. Diagnostic and treatment of caustic ingestion. *Ugeskr Laeger*, 1994; 28 :4125-6.
21. Christesen HB. Ingestion of caustic agents: Epidemiology, pathogenesis, course, complications and prognosis. *Ugeskr laeger*, 1993; 31:2379-82.
22. Poley JW, Steyerberg EW. Ingestion of acid and alkaline agents: outcome and prognostic value of early upper endoscopy. *Gastrointest Endosc*, 2004; 3:372-7.
23. Eretekin C, Alimoglu O. The results of caustic ingestions. *Hepatogastroenterology*, 2004 Sep-Oct; 59:1397-400.
24. Garsia Diaz E, Castro Fernandez M, Romero Gomez M. Upper gastrointestinal tract injury caused by ingestion of caustic substances. *Gastroenterol Hepatol*, 2001 Apr; 4:191-5.
25. Conforto F, Gercitano M, Tanga I. Emergency treatment of esophago-gastric lesion in caustic ingestion patients. *Critical Care*, 2004; 8:284.
26. Aviable from: ccforum.com/content/8/S1/P284
27. Yong Han, Qing-Shu Cheng, Xiao-Fei Li, Xiao-Ping Wang. Surgical management of esophageal strictures after caustic burns: A 30 years of experience. *World J Gastroenterol*, 2004 October 1; 9:2846-9.
28. Gumaste VV, Dave PB. Ingestion of corrosive substances by adults. *Am Gastroenterol*, 1992; 1:1-5.

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