

# Evaluation and Management of Post-caustic Stenosis

RODICA DANIELA BIRLA<sup>1</sup>, PETRE ANGEL HOARA<sup>1</sup>, VALERIU GABI DINCA<sup>2\*</sup>, SILVIU CONSTANTINOIU<sup>1</sup>

<sup>1</sup>Carol Davila University Bucharest, Faculty of Medicine, 8 Eroii Sanitari, Bucharest, Romania

<sup>2</sup>Titu Maiorescu University Bucharest, Faculty of Medicine, 22 Dambovnicului, Bucharest, Romania

*After caustic ingestion, patients may be either asymptomatic or may exhibit a variety of initial signs and symptoms, depending on the digestive segment predominantly affected. The DROOL system is a noninvasive scoring method used for the evaluation of esophageal lesions and has a good correlation with the development of esophageal stenosis. Management of these patients depends on several factors, including the presence of the symptomatology, in addition to the nature of the caustic substance. Upper endoscopy is indicated in the first 48 hours or after the first two weeks, when it is recommended to start endoscopic dilation sessions. If endoscopic treatment is inefficient, surgical treatment is required.*

**Key words:** caustic ingestion, esophageal stenosis, esophageal bypass

Patients with caustic ingestion may present hypersalivation, inability to eat, dysphagia, odynophagia, retrosternal or abdominal pain, vomiting, fever, agitation and dyspnea. Most of these symptoms are mild, lasting only a few hours. Hypersalivation is present, because esophageal edema makes swallowing impossible; hypersalivation disappears when the edema decrease. Appetite improves after stopping hypersalivation, but a inability to eat may persist. Even if oral lesions are absent, esophageal damage cannot be excluded. [1].

A long duration of hypersalivation, more then 24 hours indicates the presence of severe esophageal injury [2].

The stridor, the hoarseness, the obvious dyspnea are suggestive for the involvement of the airways. Acute upper airway obstruction may be caused by laryngeal edema, caused by the aspiration of caustic substances into the upper airways. The concentrated ammonia smoke can be inhaled, causing edema of the nasal and pharyngeal mucosa. Respiratory symptoms may develop immediately or after a few hours. Persistent fever, chest pain, hypotension or the acute abdomen may indicate visceral perforation [1]. Many studies have sought to correlate the symptomatology with the severity of the esophageal lesion or the degrees of endoscopic lesions; the results were contradictory [3].

In efforts to avoid needless endoscopy, some research has identified strong relationships between symptomatology and the endoscopic grades of gastro-esophageal injury, and have concluded that endoscopy is not essential in all patients [4].

Some authors introduced the DROOL score (D, Drooling saliva; R, Reluctance to eat; O, Oral and oropharyngeal burns; O, Other signs/symptoms; L, Leukocytosis) . A score of less than 4 was highly predictive of esophageal stricture development (100% sensitivity, 96.63% specificity, 85% positive predictive value, 100% negative predictive value,  $P < 0.001$ ) This system is a noninvasive scoring method based on the duration and severity of symptomatology including hypersalivation(>12 h), inability to eat (>24 h), and leukocyte count (>20 000/ mL) [2].

The authors suggested that the DROOL score should be preferred to endoscopic grading after caustic ingestion [2].

A multicenter, observational Italian study of 102 patients revealed that the presence of three or more signs or symptoms was indicative of a severe esophageal lesions [5].

Another study showed that no strong correlations are evident between blood counts or blood gas data and caustic ingestion outcomes. However, a leukocyte count more than 20 000/mL, an arterial pH below 7.22, and a base excess greater than 12 are indicative of severe esophageal injury [2,6]

The acute phase of caustic injuries involves perforation of the esophagus, stomach, or duodenum. Chronic phase of corrosive injuries may result in several complications, most common among them is an esophageal strictures, that cause dysphagia [7].

However, the patients are usually not symptomatic when the lumen of the esophagus remains >10 mm.[8]

In a study Mamede et al., was observed that 89.3% of patients developed esophagitis following caustic ingestion and mortality was 1% in the acute phase [9].

Thus, the esophageal stricture frequency varies from 25 to 90% of cases, even in children with severe caustic lesions [9,10].

Gastric involvement can lead to achlorhydria or outlet obstructions. Gastric outlet obstructions are much less common than esophageal strictures, constituting about 5% of all caustic injuries [7].

## Clinical and paraclinical investigations

Anamnesis of a patient who ingested a caustic substance, especially if it was for suicidal purpose, requires special attention, because besides the personal pathological background that can influence the good development of the surgical treatment he may have a psychiatric profile, which will cause him to resort to the same gesture after the treatment is instituted [11].

Primary assessment of these patients should include taking a detailed medical history to determine the timing of contact , the amount and chemical nature of the caustic substance, the form of the container, and whether the container was original or not [12].

Otolaryngology exam is mandatory for patients who have ingested caustic substances, observing changes or laryngeal and epiglottic lesions, which may cause respiratory failure, requiring a emergency endotracheal intubation, cricothyroidotomy, or tracheostomy.

A standing chest radiograph is necessary to exclude the presence of free air in the mediastinum or peritoneum.

\* Phone:(+40)722353789

Lateral neck radiography should be performed at patients exhibiting stridor or hoarseness. However, if perforation is suspected, computerized tomography is recommended [2,13].

Endoscopy evaluates only the gastro-esophageal mucosa; esophageal muscle layer lesions and necrosis inducing esophageal stricture formation are not adequately assessed.

Zargar et al recommended since 1991, after initial stabilization, endoscopic examination of the upper gastrointestinal tract was attempted between 6 and 36 hours after corrosive ingestion. However, the following precautions were undertaken while performing endoscopy in these patients: (1) the endoscope was advanced across the cricopharynx under direct vision, (2) it was advanced under visual control slowly and gently with minimal air insufflation, (3) it was never retroverted or retroflexed, (4) it was gently guided through the areas of severe injury, and (5) it was routinely passed into the stomach unless severe esophageal damage precluded its advancement at 4 weeks, 6 months, and 1 year after the injury, to look for late sequelae. The same authors classified the postcaustical lesions according to the endoscopic aspect in 5 degrees: 0 - normal-appearing mucosa, I - edema or erythema of the mucosa, IIA - hemorrhages, erosions, superficial ulcers, IIB - circumferential lesions, IIIA - focal necrosis, ulcers deep gray / black color IIIB - extended necrosis IV- perforation [8].

And other authors think that early endoscopy within 48 h is the most effective manner by which to assess the gastro-esophageal mucosa after caustic ingestion [14,15].

However, the indications for early endoscopy in such patients remain debated. Some studies have recommended performing early endoscopy in symptomatic patients and all cases of intentional ingestion, even if such patients are asymptomatic. Another authors consider that, early endoscopy is not necessary for all cases with caustic ingestion [16,17].

Endoscopic evaluation is the most used technique for establishing the severity of caustic injury. The esophagus is weakest between the 7th and 21st days of injury; during this period, frequency of endoscopic complications such as fistulas, perforation, and bleeding usually increase in patients with severe lesions [18].

Using  $^{99m}\text{Tc}$  sucralfate scan, some authors noted that low-grade sucralfate scan finding has the potential to successfully eliminate the need for invasive endoscopy and mandatory endoscopy is required in children with high-grade adhesion seen on  $^{99m}\text{Tc}$  sucralfate scan [19].

## Management

Although appropriate first aid after caustic ingestion has been defined, unfortunately, confusion and ambiguity still reign when management is considered. Symptomatology is varied and is attributable to the amount, kind, chemical nature, concentration of the material ingested and the duration of contact [2].

The possibility of toxic effects from caustic injury should also be considered. A detailed physical examination focusing on airway assess and hemodynamic stabilization is required. In some patients, urgent endotracheal intubation or surgical airway procedures may be needed [1,2]. Vomiting should not be induced to avoid reexposing injured tissues to the caustic substance. If a patient exhibits persistent vomiting, a nasogastric tube should be gently inserted [20,21].

Charcoal administration is not recommended as charcoal does not adsorb caustic substances [1,2]. Dilution therapy has also been recommended by some authors; however, no evidence supports such therapy in humans, and it is best avoided, as it may induce vomiting, perforation, or aspiration [22].

Management of these patients depends on several factors, including the presence of the symptomatology, in addition to the nature of the caustic substance. Patients with vague histories without symptomatology should be observed for a few hours, offered clear liquids, and discharged home after instructing the family to seek medical advice if dysphagia or a inability to eat develops [1,2,22].

Patients who intentionally swallow caustic substances in suicide attempts require special attention, as they are more likely to have ingested large amounts compared with those who ingested caustic substances accidentally [3,22]. In addition, patients with symptomatology of an acute abdomen, mediastinitis, airway obstruction, or any perforation require specific careful management in a intensive care unit [1,2,22].

Uygun et al. did not recommend initial endoscopy for all patients because endoscopic data are not important in terms of initial management; signs and symptoms are critical in this context. If any symptom, such as a reluctance to eat, dysphagia, or vomiting (mild, severe, or suspicious) persisted, endoscopy should be performed 10–14 days after ingestion to diagnose any esophageal stricture promptly, and simultaneously initiate esophageal dilation [2].

Various drugs have been used to treat these patients; these include neutralizing agents, antibiotics, systemic corticosteroids, and antacids. In addition, starvation, total parenteral nutrition, and nasogastric tubes have been applied. However, the optimal management strategy remains controversial; no strategy is entirely effective [23,24].

Proton pump inhibitors and  $\text{H}_2$  blockers can have a beneficial effect on mucosal healing and decrease the risk of stress ulcer. This was also demonstrated in a 2013 study, which showed an improvement in post-caustic lesions in patients who were treated with Omeprazole [25,26]. Sucralfate has an adjuvant effect through protection on esophageal ulcers, due to maintaining blood flow and maintaining vascular integrity at this level [27].

Corticosteroids can decrease inflammation and formation of fibrous tissue. Some authors suggested that corticosteroids are a component of the management to prevent stricture formation. High-dose steroid therapy in case of severe lesions may decrease esophageal injury and the need for esophageal dilation [28], but a meta-analysis of studies concluded that steroids did not decrease the incidence of stricture formation [29].

Antibiotic therapy is indicated in patients with caustic ingestion, because at the level of the lesions there is a high bacterial load. Theoretically, antibiotics are indicated for those with severe injuries because such patients develop microabscesses in the esophageal wall. This therapy is applied to manage respiratory sepsis, persistent fever, or when digestive perforation is suspected. Prophylactic antibiotics may be indicated during dilation procedures; some authors reported cerebral abscesses have developed following repeated esophageal dilation [30].

Esophageal stricture development is a major complication after caustic ingestion and its frequency is variable (1.72–15%) [15,23].

Esophageal balloon dilation is the traditional treatment for esophageal stricture; however, the guidelines remain unclear. Although the method is commonly initiated in the third week after ingestion, with high rate of success. This technique is associated with only a minimal need for gastrostomy, but it is more expensive than bougienage, because the balloon catheters are disposable [1,2,22,31].

Local steroid injection (triamcinolone acetate) into short esophageal strictures has yielded some success when combined with dilation, but has not been prospectively evaluated [32].

Esophageal stents, partial esophagectomy, and esophageal replacement surgery are alternative methods [33,34]. Esophageal stents are not often placed, because such stents may induce erosion of the trachea or bronchus [23,35].

Esophageal carcinoma is a late but very serious complication of severe caustic injury. Its incidence after caustic ingestion has varied from 2 to 30% in various patient series; carcinoma develops 1–3 decades after ingestion [36].

Some authors noted that the incidence of esophageal carcinoma in these patients is 1,000-fold that of control patients of similar age, highlighting the need for enforcement of sanctions [23,36,37].

## Conclusions

Esophageal stricture is a major complication that occurs after caustic ingestion and must be quickly diagnosed and treated through endoscopic dilation sessions. If the dilatation fails after a few months, a bypass surgery or replacement of the esophagus should be performed. Unfortunately, neither endoscopic treatment nor esophageal bypass surgery can prevent the development of esophageal carcinoma, the incidence of which is high in these patients.

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