

Research Paper: Effectiveness of Corticosteroid Therapy for Caustic Esophageal Injury



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Citation Mirhashemi SH, Hadizadeh-Neisanghalb M, Salehi M, Rostami P. Effectiveness of Corticosteroid Therapy for Caustic Esophageal Injury. International Journal of Medical Toxicology and Forensic Medicine. 2018; 8(4):131-136.



Article info:

Received: 02 Apr 2018

First Revision: 25 Apr 2018

Accepted: 13 Aug 2018

Published: 01 Oct 2018

Keywords:

Caustics, Steroids, Esophageal stenosis

ABSTRACT

Background: Delayed caustic injury complications are common, especially in developing countries, and several treatments have been proposed to prevent the resulting esophageal strictures so far. Although inflammatory nature of caustic injury makes the anti-inflammatory agents a viable option, few studies have investigated these agents. High-dose corticosteroids therapy for reduction of stricture formation in the esophagus after the ingestion of caustic material is still a controversial topic. In this regard, this study aimed to determine the impact of high doses of methylprednisolone in preventing esophageal stricture.

Methods: A total of 112 patients with grade II esophageal caustic injury, diagnosed by esophagogastroscope within 24 hours of injury, were enrolled in our study. The treatment group (n=44) received methylprednisolone (1 g/d for 3 days), pantoprazole, ceftriaxone, and metronidazole and the control group (n=58) received the same regimen excluding methylprednisolone. Endoscopic and radiologic findings were used to compare the severity of the damage to the esophagus and stomach between the two groups.

Results: After 8 months of follow-up, stricture development was observed in 3 (5.6%) patients in the treatment group and in 11 (19%) patients in the control group. The difference was statistically significant (P=0.038). The gastric outlet obstruction was observed in 4 (7.4%) patients in the treatment group and in 19 (32.7%) patients in the control group. Again, the difference was statistically significant (P<0.05). There were not any side effects due to the high doses of methylprednisolone in the study group.

Conclusion: High doses of methylprednisolone can prevent the development of esophageal stricture in grade II of caustic injury.

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1. Introduction

The most common injuries due to the ingestion of caustic agents are upper airway burn, esophageal stricture and hematemesis [1]. The grade of esophageal damage following caustic ingestion can be documented by endoscopy [2]. The prevalence of esophageal stricture in corrosive esophagitis is 5%, and this ratio increases to 47% in severe cases [3]. Because of the large diameter of stomach, gastric strictures presented by gastric outlet obstruction are uncommon and mainly caused by acids [4].

In 75% to 80% of cases, the antrum is involved, but hourglass (15%) and diffuse gastric (5%) may also be involved in some cases [5, 6]. Half of the patients had concomitant esophageal strictures, and gastric outlet obstruction might be unmasked after treatment of esophageal involvement [1]. Management of caustic injuries may require a multidisciplinary approach involving many specialties, including emergency care, surgery, anesthesiology, gastroenterology, radiology, otorhinolaryngology, and psychiatry [3].

Corticosteroids have been proven to inhibit inflammation. The central role of endothelium in inflammation has been already suggested. By expressing leukocyte adhesive molecules, endothelium directs the circulating white blood cells into the extravascular tissues, and steroids have been shown to prevent this phenomenon [7]. It has also been postulated that the main reason for complications of caustic injuries is fibroplasia which steroids can affect it, too [8].

Many institutes administer corticosteroids for patients following caustic ingestion; however, this practice is not universally acceptable [9]. Previous studies yielded conflicting results regarding the use of corticosteroids in caustic injuries [10, 11]. The current study aims to evaluate the efficacy of high-dose methylprednisolone treatment in preventing the development of esophageal stricture in grade II caustic injury.

2. Materials and Methods

This double-blind randomized clinical trial was performed in poisoning tertiary care center of Loghman-Hakim Hospital, Tehran, Iran in 2015-16. The study was approved by Shahid Beheshti University of Medical Sciences Ethics Committee. Full description of the study was presented to all patients or their next-of-kin and informed consent was granted. Initially the patients

were examined and their demographics were recorded. Complete blood count, erythrocyte sedimentation rate, biochemical analysis, urine analysis, arterial blood gas and chest X-ray were performed for all patients. Endoscopic examinations of the upper gastrointestinal system was performed within 24 hours of injury to evaluate the extent of injury based on Zargar grading [2].

Patients with grade II esophageal damage were included in the study. The endoscopist was blinded to the patient groups. Patients who suffered from grade I or III injuries and patients with symptoms of mediastinitis, pneumonia, upper gastrointestinal bleeding, or perforation were excluded from this study. Then, the patients in the treatment group received the following protocol: methylprednisolone (1 g, IV infusion for four hours) daily for three days, pantoprazole (40 mg, IV) twice daily, ceftriaxone (1 g, IV) twice daily and metronidazole (500 mg, IV) three times per day. The control group received the same treatment regimen without methylprednisolone. During the study, the patients were monitored for complications such as hyperglycemia, high blood pressure, electrolyte levels and the presence or absence of infection.

All patients were controlled with blood pressure and Blood Sugar (BS) monitoring during methylprednisolone injection. Patients whose endoscopic findings improved (normal and grade I) and those who could tolerate oral nutrition were discharged. All patients were scheduled for follow-up visits for 8 months after the ingestion. During the follow-up visits, the patients were evaluated for the clinical symptoms and signs of dysphagia, odynophagia and gastric outlet obstruction. Barium swallow was performed and reported by expert radiologist and assessed by the same radiologist who remained blinded to the patient groups.

SPSS V. 19 was used for statistical analysis. The Independent sample t-test and Chi square test were used to examine our hypothesis. $P < 0.05$ was considered statistically significant.

3. Results

During the study period, 213 patients were admitted to the emergency department due to caustic injury. Among these, 112 patients with grade II injury were recruited for this study. A total of 54 and 58 patients were enrolled in the treatment and control group, respectively.

Demographic and clinical characteristics of groups are presented in Table 1. There were no significant differences

between groups In terms of age, gender, type of ingested substance, ingested amount and admission time. Acid-based chemicals were documented as the most frequently ingested caustic. The endoscopic findings of gastric injury are presented in Table 2. Higher rate of gastric injury was seen in the treatment group (P=0.001).

There were not any side effects associated with the high dose methylprednisolone consumption in the study group. All patients in the study group were monitored during the therapy. Patients in both groups were followed up for eight months regarding complications of caustic injury. Incidence of complications are presented in Table 3. Delayed surgical interventions are shown in Figure 1.

4. Discussion

Esophageal stricture is one of the most common consequence of caustic injury [3]. More than 70% of patients

with grade IIb and up to 90% of patients with grade III injury are prone to develop esophageal stricture [12]. Development of stricture can initiate as early as 3 weeks but peaks at 8 weeks after the ingestion. Stricture and gastric outlet obstruction can pose threats to patients' life quality and health economy [3, 6, 12]. Therefore, efforts have been made to reduce these sequelae.

Previous studies on corticosteroid administration for prevention of stricture formation in caustic ingestion were mainly on pediatric subjects and results were inconsistent. Usta et al. studied the effect of methylprednisolone at a dose of 1 g/1.73 m²/d for 3 days in children with grade IIb esophageal burn; their result showed benefits in reducing stricture development and shortening total parenteral nutrition length. Also no side effect was reported [13]. Likewise, in study of Bautista et al., dexamethasone (1 mg/kg/d) was reported to be more effective than prednisolone (2 mg/kg/d) in the prevention of stricture formation (38.9% vs. 66.7%) and the

Table 1. Clinical and demographic characteristics of study groups

Characteristic	Treatment	Control	P
Age, y	38.76±16.69	39.97±16.74	>0.05
Male sex	28(51.9)	33(56.9)	>0.05
Acid-based chemical ingestion	30(55.6)	30(51.7)	>0.05
Ingested volume, mL	127.59±121.12	130.19±121.86	>0.05
Admission, h	5.95±6.69	6.64±6.67	>0.05

Data are presented as Mean±SD or No. (%).

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Table 2. Distribution of gastric injuries in study groups

Characteristic	Grade of Gastric Injury					
	NL	La	Lb	Lla	Llb	III
Treatment (n=54)	4(7.4)	4(7.4)	9(16.7)	11(20.4)	24(44.4)	2(3.7)
Control (n=58)	0	1(1.7)	11(19)	32(55.2)	12(20.7)	2(3.4)

Data are presented as No. (%).

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Table 3. Incidence of delayed complication of caustic injury in groups

Characteristic	Treatment (n=54)	Control (n=58)	P
Dysphagia	5(9.3)	8(13.8)	>0.05
Esophageal Stricture	3(5.6)	11(19)	=0.032
Gastric outlet obstruction	4(7.4)	19(32.7)	<0.05

Date are presented as No. (%).

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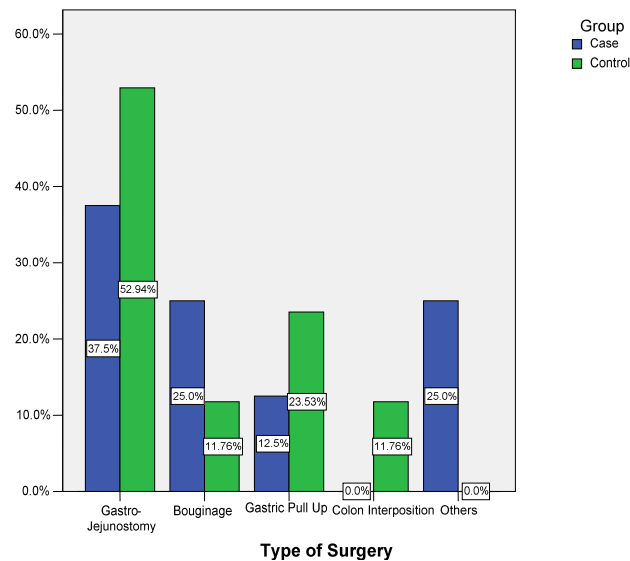


Figure 1. Incidence and type of delayed surgical intervention in both groups

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development of severe stricture (27.8% vs. 55.6%) [14]. However, Anderson et al. showed that prednisolone at a dose of 2 mg/kg intravenous then orally in three weeks did not contribute in preventing stricture expansion [15].

Bouktir et al. administered 1 g/1.73 m²/d methylprednisolone in 23 pediatric patients with grade IIb and III esophageal burns. They observed significantly fewer strictures formation in corticosteroid-treated group [16]. Similar result was reported by Mazigh and associates [17]. Fulton et al. evaluated previous data with systematic pooled analysis in caustic injury, although methodologically limited, data were unreliable to approve the value of steroids in treating patients with caustic-induced grade II esophageal burns [18]. The most recent meta-analysis has also shown no proven benefits with corticosteroid therapy [11].

In the presented study, the treatment group received IV infusion of 1 g methylprednisolone for 3 days. All patients had grade II esophageal burns. Overall, 12.5% of all patients developed esophageal stricture. Corticosteroid therapy significantly reduced the incidence of stricture formation and gastric outlet obstruction. The study population included only grade II burns, and the treatment duration was short, which may have reduced the side effects of the therapy. The included patients in the study were followed up in outpatient clinic subsequent to hospital discharge. After eight months of follow-up, the final results were analyzed. Dysphagia was observed in 9.3% of the study group and 13.8% of the control group that was statistically insignificant.

Potential limitations of the current study are the small sample size and non-matched groups in terms of gastric injury. Although the risk of gastric outlet obstruction was less in the treatment group, the included patients had significantly different grades of gastric injuries at initial evaluation. Therefore, larger samples and better matched groups can yield more reliable results. Furthermore, the current study only included patients with grade II esophageal injury, treating other grades can obtain more comprehensive and reliable results.

5. Conclusion

The esophageal and gastric stricture development rates were significantly lower in grade II esophageal injury patients treated with pulse therapy of methylprednisolone. This result may suggest the use of methylprednisolone in the prevention of strictures due to caustic injury in patients with grade II esophageal injury.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by Ethics Committee of Shahid Beheshti University of Medical Sciences. Full description regarding the study was given to all patients or their next-of-kin and informed consent was granted.

Funding

This study was supported by Shahid Beheshti University of Medical Sciences.

Authors contributions

All authors contributed in preparing this article.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgements

The authors would like to acknowledge the Clinical Research Development Center (CRDC) of Loghman Hakim Hospital and Shahid Beheshti University of Medical Sciences for the provided consultation.

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