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ARAŞTIRMA/RESEARCH

Clinical features and treatment of corrosive esophagitis

Koroziv özefajitin klinik özellikleri ve tedavisi

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Abstract

Purpose: The esophageal burns caused by corrosive substances are of great importance since they progress along with serious complications. Here, we have aimed to evaluate our 39 cases we followed up and treated in our clinic due to taking in corrosive substances according to their clinical characteristics and our treatment approaches.

Materials and Methods: Thirty nine patients whose file records could be obtained and who were treated for corrosive esophagitis between January 2000 and December 2007 were included in our study. Clinical features and treatment of those cases were recorded and evaluated.

Results: The intake rate of corrosive substances was higher in women. The amount of corrosive substance taken in was prominently higher in those having it for suicidal purposes compared to those having it by accident. According to their endoscopic features, 82.1% of the cases were found to have had endoscopic findings referred to as normal or grade 1. While ulcer grade 2-3 comprised 10.3% of all the cases, grade 4 comprised 7.7% of all the cases with severe burns.

Conclusion: To stop the oral intake, performing an endoscopic evaluation and making a treatment plan in accordance with the endoscopy results for the patients applying the clinic in the early stage due to the intake of corrosive substances are of great importance in terms of preventing the complications likely to occur.

Key words: Corrosive esophagitis, esophageal stricture, early treatment, surgical treatment

Öz

Amaç: Koroziv maddelerin oluşturdukları özofagus yanıkları ciddi komplikasyonlar ile seyrettiği için çok önemlidir. Bu çalışmada kliniğimizde takip ve tedavi ettiğimiz koroziv madde içen 39 olgumuzu klinik özellikleri ve tedavi yaklaşımlarımıza göre değerlendirmeyi amaçladık.

Gereç ve Yöntem: Çalışmamıza Ocak 2000-Aralık 2007 yılları arasında Selçuk Üniversitesi, Meram Tıp Fakültesi,Göğüs Cerrahi kliniğinde tedavi edilen ve dosya kayıtlarına ulaşılabilen 39 hasta dahil edildi. Bu hastaların klinik özellikleri ve tedavileri kaydedilerek değerlendirildi.

Bulgular: Koroziv madde içme oranı kadınlarda daha yüksek idi. İçilen koroziv madde miktarı suisit amaçlı içenlerde yanlışlıkla içenlere oranla belirgin yüksek idi. Endoskopik özelliklerine göre olguların %82.1'inde normal veya evre 1 endoskopi bulgusuna rastlanılmıştır. Evre 2-3 ülser tüm olguların %10.3'ünü oluştururken, evre 4 ağır yanık tüm olguların %7.7'ini oluşturuyordu.

Sonuç: Koroziv madde kullanımı sonrası erken dönemde başvuran hastalarda **o**ral alımın kesilmesi, erken evrede endoskopik değerlendirmenin yapılması ve endoskopi sonucuna göre tedavi planının yapılması komplikasyonların önlenmesi açısından büyük öneme sahiptir.

Anahtar kelimeler: Koroziv özefajitler, özefagial darlık, erken tedavi, cerrahi tedavi

INTRODUCTION

Esophagus is a sensitive organ unable to tolerate structural injury. The esophageal burns caused by corrosive substances are of great importance since they progress along with serious complications. As a result of taking corrosive substances in by accident or for suicidal purposes, serious pathologies such as mucosal burns in esophagus, ulcer and perforation may occur.

Taking in strong corrosive substances, particularly alkalies, may lead to perforation and mortalities

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during the acute period. The degradation of esophageal stricture developing in the patients recovering from the acute stage becomes a challenging problem[1].

In general, industrial chemical substances, cleaning agents and medications are accepted as corrosive substances. Most of the cleaning products used at home are of a heavy character, which may lead to perforation and mortalities when they are taken in. Swallowing small alkaline batteries may also cause corrosive burns in children in particular[2]. Here, we aimed to evaluate our 39 cases we followed up and treated in our clinic due to taking in corrosive substances according to their clinical characteristics and our treatment approaches.

MATERIALS AND METHODS

Demographic characteristics

Thirty nine patients whose file records could be obtained and who were treated in Selçuk University, Meram Medical Faculty, Clinic of Thoracic Surgery between January 2000 and December 2007 were evaluated retrospectively in our study. We received ethical consent from Bozok University Medical Ethics Committee. The number of the consent letter is 06.11.2015-100. All the participants were fully informed about the aims of the study, and their consents were obtained where appropriate. The Ethics Committee (Institutional Preview Board) provided approval for the study to take place. The study was conducted according to the Declaration of Helsinki as revised in 2000.

Twenty-four of our patients were female, whereas fifteen of them were male. While the mean age in women was 35.96, it was 50.67 in men. In general, which corrosive substance was taken in by those patients was learnt from the anamnesis of the patients or their relatives who applied to the emergency department of our faculty, when, how much and why it was swallowed, and whether there was any vomiting or not, and whether any additional fluid or solid nutrient was taken in or not.

The leukocyte levels of all the patients at the time of their arrival at the hospital as well as their fever, blood pressure and pulsation levels were recorded.

Endoscopic evaluation

Afterwards, the time the patient took in the caustic substance and the period of their arrival at the hospital after the caustic substance had been taken in were also taken into consideration, and a flexible gastroesophagoscopic evaluation was performed on all of our patients who had applied within the first 24 hours.No endoscopy was performed at the time of the arrival of the cases who had applied to the hospital after the first 24 hours. The oral intake of these patients was discontinued, after which they were fed parenterally, and an endoscopic evaluation was performed after an average of 7 days. In all the cases, endoscopy was performed up to the region where the initial lesion in esophagus was seen due to the perforation risk caused by further progress. Our endoscopic findings were classified from Grade 0 to Grade 4 according to the findings that varied from a normal and large mucosal edema to deep ulceration and perforation[3].

Follow up and medical treatment

The patients with totally normal endoscopic findings, the oral feeding was started with fluid foods in a controlled fashion. The patients who did not develop any problems during the radiological evaluation were discharged from the hospital later on. In the patient population with Grade 2 and Grade 3 esophageal burns, on the other hand, the oral feeding process was totally discontinued for at least one week, and a parenteral feeding was administered.

In order to avoid local infections in these patients, an antibiotic was applied through the IV way for at least 10 days. To avoid the reflux of the gastric acid, a proton-pump inhibitor and a standard antiemetic or an H2 receptor blocker was applied.A steroid treatment with a dose of 1mg/kg/day was administered for the purpose of minimizing mucosal edema and preventing stricture development. In these cases, according to the clinical condition of the patient, a controlled esophagogastroscopy was performed in the wake of an average of 7-10-day-follow up and treatment. The cases in whom no pathology could be determined were discharged from the hospital after having been kept in close watch for at least 24-48 hours more after the fluid foods were started.

Surgical procedures

On the other hand, an esophagitis bypass was maintained by performing plug dilatations in 2 cases

(5.1%) during whose follow-ups an obstruction had developed, and then no additional surgical intervention was required. Esophagoscopy and bronchoscopy were performed in one of our cases who had taken in some pesticide. Upon determining a tracheo-esophageal fistula in the cervical region, it was decided that a surgery had to be performed.

During the surgery, first the fistulous tract was executed through a left cervical incision, and fistulectomy was performed. After a separate double primary suture closure was performed on the mucosa and serosa of the perforation area in esophagus, the perforation area in the trachea was fixed through primary sutures. Afterwards, peripheral muscle tissues were brought between trachea and esophagus and were supported. Upon the development of an obstruction in the trachea in the course of the succeeding follow-ups of the patient, a tracheal metallized stent was applied. Upon the development of a granulation tissue in the distal line of the tracheal stent 2 years after the discharge from the hospital, the granulation tissue was cleaned out by using an endoscopic laser after bronchoscopic dilatation was performed. Our non-complicated patients were being followed up for 6 months, but complicated patients were being followed up for longer periods of time.

Statistical analysis

For the statistical analysis, the 18th version of the SPSS software was used. The continuous variables were presented as "mean ± SD", and the categorical variables were presented as frequency (%). The categorical variables were compared by using the Chi-Square test. The Spearman Simple Comparison Analyses were used to show the relationship among the continuously varying parameters, whereas the Mann-Whitney U Test and the Kruskal-Wallis were used to put forward the difference between the groups. The P values which were smaller than 0.05 were accepted as being statistically significant.

Table 1. Comparison between age, sex, drinking amount, and duration of arrival to hospital in terms of cause of substance intake

Variable	Suicide (n=6)	By mistake (n=33)	p value
Age (year, mean±SD)	51.67±16.73	39.79±18.47	0.129
Amount of drinking (ml/day)	200	123.03±68.80	0.012
Duration of hospitalization (day)	3.50±4.18	4.06±8.91	0.558
Sex (n,%)			
Female	3 (12.5)	21 (87.5)	>0.05
Male	3 (20)	12 (80)	

RESULTS

Demographic results

The intake rate of corrosive substances was higher in women (p=0.019). As for men, the amount of corrosive substances taken in (average= 166,67 ml) was calculated as higher when compared with that in women (115 ml). While the cause of substance intake in both female and male patients was generally by accident, there was also intake of corrosive substance for suicidal purposes in each 3 cases in both genders (Table 1). While the mean age in those taking in corrosive substance for suicidal purposes was 51.67, it was 39,79 in those taking in these substances by accident. The amount of corrosive substance taken in was prominently higher in those having it for suicidal purposes (average=200 ml) compared to those having it by accident (average=123.03 ml) (P=0.012). There was no statistically significant difference found in the comparison made between those taking in substance by accident and those using it for suicidal purposes in terms of their arrival time at the hospital (P= 0.558) (Table 1).

The substances taken in were investigated and classified into two groups as acidic and basic (alkaline) according to their pH values. While the basic substances our patients had taken in consisted of chemical substances such as bleach, oil solvent, descaling agent, ammonium chloride and zephiran, the acidic substances contained chemicals like pesticide, hydrogen peroxide, hydrochloric acid and thinner. The intake rate of basic substances (71.8%) was found to be higher than that of the acidic ones (28.2%). There was no difference between those taking in acidic substances and those having basic ones in terms of their arrival time, leukocyte levels, blood pressure and pulse values (Table 2).

Endoscopic findings

According to their endoscopic features, 82.1% of the cases were found to have endoscopic findings referred to as normal or Grade 1. While ulcer Grade 2–3 comprised 10.3% of all the cases, Grade 4 comprised 7.7% of all the cases with severe burns (Table 2). In terms of the duration of hospital stay, there was a significant increase between Grade 2-3 and Grade 4, respectively, when compared to the normal ones and Grade 1 (P=0.003). The leukocyte level was found to be higher in the patients referred to as Grade 4 (P=0.015). There was no correlation between the blood pressure and the pulsation along with the endoscopic features (Table 3).

Table 2. Differences of their arrival time to hospital, leukocyte levels, blood pressure, pulse values, endoscopic features in terms of acidic and basic (alkaline) substances intake

Variable	Alkaline (n=28)	Acidic (n=11)	p value
Age (year, mean±SD)	40.25±18.01	45.09±20.23	0.492
Amount of drinking (ml)	141.79±67.99	117.27±72.12	0.336
The duration of arrival to hospital (hour)	3.39±8.76	5.45±7.23	0.298
Leucocyte (1000/mm3)	9.99±2.18	13.21±7.13	0.595
Systolic blood pressure (mmHg)	122.71±11.87	112.64±20.95	0.381
Diastolic blood pressure (mmHg)	76.61±6.86	70.55±8.59	0.097
Pulse (/min)	83.11±9.57	91.36±16.28	0.111
Endoscopic features (n,%)			
Normal/Grade 1	24 (85.7)	8 (72.7)	>0.05
Grade 2-3	2 (7.1)	2 (18.2)	
Grade 4	2 (7.1)	1 (9.1)	

Table 3. Correlation of age, time of stay at hospital, leucocyte, blood pressures, and pulse according to endoscopic features

	Normal/Grade 1 (n=32)	Grade 2-3 (n=4)	Grade 4 (n=3)	p value
Age (year, mean±SD)	38.97±19.08	50.75±7.36	57.67±11.02	0.140
Duration of hospitalization (day)	5.63±7.06	10.50±4.04	35.33±21.45	0.003
Leucocyte (1000/mm3)	10.85±4.44	8.30±0.46	14.86±3.92	0.015
Systolic blood pressure (mmHg)	119.47±14.08	127.50±4.21	114.00±35.04	0.417
Diastolic blood pressure (mmHg)	75.46±7.45	78.00±4.00	74.33±15.63	0.519
Pulse (/min)	85.16±11.52	80.75±5.12	94.67±23.71	0.698

DISCUSSION

Frequent corrosive esophageal burns are serious health problems due to the fact that they cause significant mortality and morbidity. Corrosive esophageal burns are mostly caused by the substances in fluid form which are used in home cleaning and sometimes by the toys in particular when they are swallowed by children. These types of burns may lead to serious clinical pictures that may start with a simple esophagitis and progress towards esophageal perforation. Corrosive esophagitis is a condition encountered in children of age 1-5, whereas it is more commonly seen in adults of age 20-30 [3,4]. While corrosive substances are taken in by children in little amounts and often by accident, they are taken in by adults in large amounts for suicidal purposes in general, due to which an esophageal damage progressing more severely in a sequellae fashion occurs[4,5]. The most frequent cause of taking in corrosive substances by accident is the cleaning agents in beverage and water bottles. In our series, the cause of the intake in both male and female patients was generally the intake by accident, whereas in 6 cases, it was due to suicidal purposes. All the patients who had taken in these substances for suicidal purposes were adults. The amount of the corrosive substance taken in with suicidal purposes (average: 200ml) was higher than those that had taken them by accident (average:123.03 ml).

What corrosive substance was taken by the patients, when it was taken, at in what amounts it was taken, whether or not they had vomited, and whether or not they had taken any additional fluid or solid foods must be learned from the patient or his/her relative applying the clinic with the complaint of an intake of corrosive substance, and then all the liquid and solid food intake must be discontinued. A parenteral supplement therapy must be started[6]. In addition, precautions against the complications like shock, laryngeal edema and aspiration pneumonia must be taken, as well. Measures for avoiding patient's vomiting and regurgitation must definitely be taken. Afterwards, the endoscopic evaluation of the patient must be performed. Some authors suggest that the endoscopic procedure should be performed in the first 24 hours in order to evaluate esophageal injury. Thus, the long-term hospital stay of the patients with no burns will have been prevented[1,2]. Due to a perforation risk, a flexible fiber-optic endoscopy must definitely be preferred in order to evaluate esophagus. Moreover, the endoscopic procedure should be carried forward only until the initial lesion has been noticed, since further proceedings will increase the risk of iatrogenic perforation.

Rigid endoscopy is indicated in extracting solid substances that are clung, due to which powerful chemical leakage continues towards esophagus and the trauma goes on. In particular, small batteries used in electronic toys are dangerous due to high concentrations of powerful alkaline materials (potassium hypochlorite). In such cases, batteries should immediately be removed through rigid endoscopy[7].

In our series, we performed the first evaluation on all the patients through a fiber-optic flexible endoscopy. All our patients who had applied to the clinic within the first 24 hours after having taken in corrosive substances underwent a flexible endoscopic evaluation, and their medical treatments were arranged during the early period. No endoscopy was performed on the cases who had applied to the clinic after the first 24 hours at the time of their arrival at the hospital. The oral intake of these patients was discontinued, after which they were administered with parenteral feeding, and then an endoscopic evaluation was performed within 7 days on the average, following the evaluation in accordance with clinical conditions. Those who were normal were discharged from hospital after oral feeding was started.

In previous clinical studies, the fluid received from 75-95% of the cases who had taken corrosive liquid consisted of basic substances. In those who swallow basic substances, the distal esophagus is the region where the burn is mostly seen. Also in our cases, the intake rate of basic substances (71.8%) was much higher than that of the acidic ones (28.2%), which is in compliance with the literature. Normally, since the contact period in the distal esophagus takes a longer time, the most common injury is usually seen in this region[7]. The pH value of the substances like the detergents used at home ranges between 9 and 11, and they do not cause serious burns so long as they are not taken in large amounts. Yet, if the pH value rises above 11, it may lead to severe burns even in small amounts[8,9]. We are of the opinion that the reason why the endoscopic findings in our cases proved to be on a slight level was due to the fact that the pH value of the cleaning agent taken in was below[11].

Endoscopically, in corrosive esophageal burns, there may be clinical pictures likely to be encountered, from minimal mucosal injuries to full-thickness necrosis and perforation in the esophagus wall. The classification of an esophageal burn according to endoscopic findings is made as follows: Grade 0: normal, Grade 1: mucosal edema and hyperemia, Grade 2: Hemorrhage, ulcers changing from superficial into deep-rounded ulcers, Grade 3: Burnt and necrotic regions, Grade 4: Perforation[3]. Among our cases, 82.1% were found to have had normal or Grade 1 endoscopic findings, whereas Grade 2-3 ulcers comprised 10.3% of all the cases, and Grade 4- deep ulcers and perforation, on the other hand, comprised 7.7% of all the cases. Acidic substances mostly bring about coagulative necroses. The alkaline pH and squamous epithelium of esophagus also protect esophagus from the effects of the acids to some degree. Despite this, there may be burns in the esophagus at a rate of 6-20% when acidic substances are taken in. Acids may cause damage in the stomach on a higher level when compared with alkaline substances[10,11]. In the regions where basic corrosive substance is effective, a liquefaction necrosis occurs in the first place, and this process continues until the substance taken in is neutralized. In corrosive esophageal burns; edema, hemorrhage, thrombosis and local necrosis occur in the tissue in the first 48 hours of the burn in question. In corrosive esophagus, the free oxygen radicals

increase in the burnt tissue in the first 72 hours, starting from the moment of exposure. At the early stage of the wound recovery, the development of stricture can be prevented by minimizing the inflammation period when the free oxygen radicals are inactivated. To that end, it is suggested that steroids and broad-spectrum antibiotics should be administered in the early stage. In previous studies, it was reported that caffeic acid, phenyl ester and epidermal growth factors were used, which led to positive results as to the minimization of inflammation and stenosis index[11-15]. In spite of all these treatments, 7-15% of corrosive esophageal burns result in esophageal stenosis[16]. When used on wounded tissues, steroids decrease neovascularization, collagen synthesis and contraction as well as inhibiting epithelization. They also diminish prolyl hydroxylase and lysyl oxidase activities as well as slowing down the collagen formation. In addition, they enhance collagen destruction by activating collagenase. As a result, softer and less aggregations are formed[1].

In corrosive esophageal burns, there are series in which steroid application has been tried and found to be effective as well as those suggesting that the use of steroids has been ineffective. In one of the studies, it was reported that when patients were categorized according to esophageal injury and steroid treatment, the administration of steroids to those with Grade II and Grade III esophageal injury did not decrease the stricture formation[6]. Thus, mostly, the personal experiences of physicians become prominent in the use of steroids. In our clinical practice, the steroid treatment of a dose of 1mg/kg/day for all the patients was administered to all the patients, and only in 2 patients (5.1%) did stenosis develop, for which dilatation was required.

Bacteria are easily invasive from the burnt mucosa towards mediastinum despite the fact that there is no perforation in the esophageal burn. For this reason, antibiotics are unquestionably used for approximately 10 days parenterally for corrosive esophageal burns[1]. In our cases, a 2nd generation cephalosporin was used parenterally throughout the hospitalization period of the patients. In one of our cases who was perforated, on the other hand, an antibiotic of a broader spectrum was used in line with the recommendations for infectious diseases, starting from the early stage. Some of the studies suggested dilatation at intervals right after the damage occurred in the cases in whom stricture developed, whereas others suggested a periodic dilatation in the wake of the development of stricture, and the success rate in dilatation was found to be between 60-80%[17]. However, with dilatation in the early or later stages, an esophageal perforation mediastinitis, empyema and bacteremia were reported to have developed[1,2]. In benign stenoses which developed in the wake of corrosive esophagitis, self-expandable plastic stents were used for about 21 months (8-39 months) on the average, yet, these strictures were reported not to have prevented the occurrence of a permanent stricture[18].

There is a surgical treatment indication in complete stenoses for which all the attempts to enlarge the lumen fail, and also in the presence of prominent irregularities/disorders and pocketings seen in Barium graphic, in the cases of periesophagial reactions or mediastinitis development, in the cases unable to tolerate the long-term dilatation periods, and in the cases of perforation or fistula formation. For the stricture occurring due to corrosive esophagus, surgical methods such as esophageal replacement, colonic interposition and jejunal interposition are surgically used. The most common organ used as a replacement is the colon. Separately, gastric tube, jejunum, free jejunal graft and stomach are also reported to have been used[19,20]. However, in some cases, it should be kept in mind that removing esophagus will be rather challenging due to esophageal obliteration and mediastinal fibrosis. Under such circumstances, the conduit may need to be transferred through subcutaneous or retrosternal pathways. The esophagus is advised to be removed due to the hemorrhage in the remaining esophagus, and the risk of mucocele and malignancy reach up to 2-8%[21]. In two of our cases in whom esophageal stenosis had developed, we performed bougie dilatation practices at intervals, and no problem occurred during their follow-up period, nor an additional surgical intervention was required.

In one of our cases who had taken in pesticides, an approach through a left cervical incision was made upon determining a tracheo-esophageal fistula in the cervical region. The fistulous tracts were executed in the first place after which the trachea and esophagus, being supported by the peripheral muscular tissue, were primarily fixed through the use of fistulectomy. During the patients' follow-up periods, a tracheal metallized stent was applied upon the development of stenosis in the trachea. 2 years after the discharge from the hospital, a

bronchoscopic dilatation was performed upon the development of a granulation tissue in the distal line of the tracheal stent, after which the granulation tissue was cleaned out by using an endoscopic laser. At present, our patient is being followed up without any problems in his postop 6th year.

As the result of our study, it follows that discontinuing the oral intake, performing an endoscopic evaluation and making a treatment plan in accordance with the endoscopy results for the patients applying the clinic in the early stage due to the intake of corrosive substances are of great importance in terms of preventing the complications likely to occur.

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