

Management of Caustic Esophageal Injury: A Survey Study in Türkiye and Review of the Literature

Kostik Özofagus Yaralanmasının Yönetimi: Türkiye’de Bir Anket Çalışması ve Literatürün Gözden Geçirilmesi

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Abstract

Objectives: Management of caustic ingestion (CI) and esophageal burns are a serious problem which causes a significant burden on the health care services. Since absence of evidence-based guidelines optimal management of CI is still yet to be determined. The study aims to evaluate clinical approach of Turkish pediatric surgeons to caustic esophageal burns.

Materials and Methods: The survey questions were prepared through a literature review for controversial issues. The survey was sent to 450 member of Turkish association of pediatric surgery via Google Forms and 106 of them responded.

Results: There were 46 (43%) participants who do not perform endoscopy in whether symptomatic or asymptomatic patients in the first apply. Sixty (56%) participants preferred to perform endoscopy at the first apply. Thirty-six (34%) of participants perform endoscopy in case of certain ingestion of caustic substance, 14 (13.5%) perform in only symptomatic patients and 10 (9.5%) perform endoscopy in any suspicion of caustic ingestion. Seventy-one (67%) of the participants declared that they do not use antibiotics routinely and forty-six (45%) stated that they do not use steroids with or without esophageal burns.

Conclusion: Although some studies on CI management have been published, a clear algorithm in management of CI has not established yet. Clinicians tend to determine different follow-up and treatment algorithms based on clinical customs and their experience.

Keywords: Caustics, endoscopy, esophageal stricture

Öz

Amaç: Kostik alımı ve özofagus yanıklarının tedavisi, sağlık hizmetleri üzerinde önemli bir yük oluşturan ciddi bir sorundur. Kanıta dayalı kılavuzların bulunmaması nedeniyle kostik alımının optimal yönetimi henüz belirlenmemiştir. Çalışma, Türk çocuk cerrahlarının kostik özofagus yanıklarına klinik yaklaşımını değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Anket soruları tartışmalı konulara ilişkin literatür taraması yoluyla hazırlanmıştır. Anket, Türkiye Çocuk Cerrahisi Derneği'nin 450 üyesine Google Formlar aracılığıyla gönderildi ve 106'ı yanıt verdi.

Bulgular: İlk başvuruda semptomatik veya asemptomatik hastalara endoskopi yapmayan 46 (%43) katılımcı vardı. Altmış (%56) katılımcı ilk başvuruda endoskopi yapmayı tercih etti. Katılımcıların 36'sı (%34) kesin kostik madde alımı durumunda endoskopi yaparken, 14'ü (%13,5) sadece semptomatik hastalarda, 10'u (%9,5) herhangi bir kostik madde alımı şüphesi varsa endoskopi yapıyor. Katılımcıların 71'i (%67) rutin olarak antibiyotik kullanmadığını, 46'sı (%45) özofagus yanığı olsun ya da olmasın steroid kullanmadığını belirtti.

Sonuç: Kostik alımı yönetimine ilişkin bazı güçlü çalışmalar yayınlanmış olmasına rağmen, yönetimi konusunda net bir algoritma henüz oluşturulmamıştır. Klinisyenler klinik geleneklere ve deneyimlerine göre farklı takip ve tedavi algoritmaları belirleme eğilimindedir.

Anahtar Kelimeler: Kostik madde, endoskopi, özofagus darlığı

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Introduction

Management of caustic ingestion (CI) and esophageal burns are a serious problem which causes a significant burden on the health care services (1-3). Initial admission of CI may be only suspicion of ingestion or symptoms such as oropharyngeal or chest pain, dysphagia, vomiting, drooling, stridor, fever and even shock (1,4). Even though CI and esophageal burns are still relatively common in some countries such as Turkey, due to absence of evidence-based guidelines optimal management is still yet to be determined (5-7). Diagnostic role of endoscopy and its timing, steroid and antibiotic usage, type and timing of dilation of strictures are controversial and all of these vary between centers (1,2). The management solely depends on the experience of the surgeons and clinical customs.

The study aims to evaluate clinical approach of Turkish pediatric surgeons (PSs) to caustic esophageal burns while emphasizing on endoscopy preference via an online questionnaire.

Materials and Methods

The survey questions were prepared through a literature review for controversial issues. Zargar et al. (8) classification was used to define grade of esophageal injury in the questions and its explained to clinicians in survey (Table 1). There is 21 questions. All participants questioned about their experience. While asking the preferences of surgeons, it has been checked that they had the all facilities and they prefer one of them. Due to prevent any confusion, it was stated that the questions must be answered for children who was hemodynamically stable and there were no suspected esophageal or gastric perforation. The survey was sent to 450 member of Turkish association of pediatric surgery via Google Forms and 106 of them responded. Ethical approval was obtained from the Human Research Ethics Committee of Ankara University Faculty of Medicine (date: 26.03.2020, decision no.: İ3-182-20). Since the study did not include patients, patient consent was not obtained.

Table 1. Endoscopic classification of esophageal caustic injuries, by Zargar et al.^{4,8}

Grade	Description
Grade 0	Normal
Grade 1	Mucosal edema and hyperemia
Grade 2A	Superficial ulcerations, erosions, exudates
Grade 2B	Deep discrete or circumferential ulcerations
Grade 3A	Focal necrosis
Grade 3B	Extensive necrosis
Grade 4	Perforations

Statistical Analysis

No further statistical study was used. Surgeons' choices are shown in tables and percentages.

Results

A hundred and six PSs answered the survey. Forty (37.7%) of them had more than 16 years of experience in pediatric surgery. Nearly half of the participants (n=52, 49%) were affiliated with university hospitals, followed by those in education and research hospitals (n=26, 26.5%), state hospitals (n=19, 18%), and private hospitals (n=9, 8.5%). There were 46(43%) participants who do not perform endoscopy in whether symptomatic or asymptomatic patients in the first apply. Sixty (56%) PSs preferred to perform endoscopy at the first apply. Thirty-six (34%) of participants perform endoscopy in case of certain ingestion of caustic substance, 14 (13%) perform in only symptomatic patients and 10 (9%) perform endoscopy in any suspicion of CI (Table 2). Among the participants who performed endoscopy at the first apply, 51 (85%) stated that they perform endoscopy in the first 48 hours, 9 (15%) stated that they performed endoscopy within 48-96 hours after the application. Seventy-one (67%) of the participants declared that they do not use antibiotics routinely. Forty-six PS (45%) stated that they do not use steroids with or without esophageal burns (Figure 1). Sixteen (15%) of participants preferred routine usage of steroid in caustic esophageal burns and 42(40%) stated steroid usage in particular patients. Among PSs who do not perform endoscopy

Table 2. Endoscopy preference of participant

Endoscopy at first admission		
Yes, n=60 (57%)	No, n=46 (43%)	
Any suspicion of CI n=10 (9.5%)	Certain caustic ingestion n=36 (34%)	Symptomatic patients n=14 (13.5%)

CI: Caustic ingestion

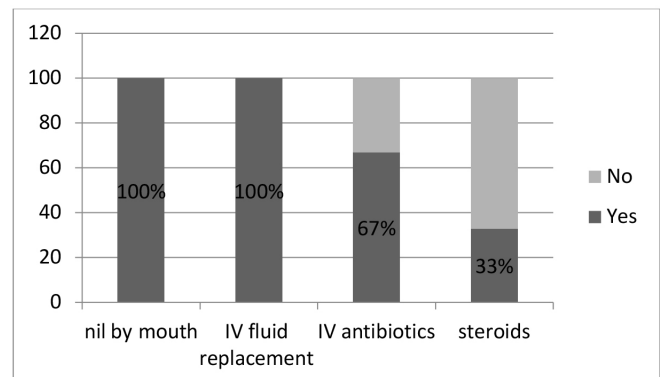


Figure 1: Routine medical treatment in caustic burns

IV: Intravenous

at first admission, 41 (89%) of them preferred endoscopy three weeks later in case of symptomatic esophageal stricture and three (9%) preferred routine endoscopy in all cases.

Sixty-two PSs (68.5%) stated that they perform further examination in follow-up only in symptomatic patients, 22 (20.8%) in patients who had Grade 2B and more serious burns in the first endoscopy. Twenty-two PSs (20.8%) preferred performing further examination in all CI cases. Participants preferred endoscopy (64%), upper gastrointestinal contrast study (UGCS) (11%) and both endoscopy and UGCS (25%) during follow-up. Eighty-five percent of PSs stated that planned examination timing was three weeks.

The participants preferred balloon dilation (57.5%), wire-guided rigid dilator (57.7%) for dilation in esophageal strictures. Detailed information is shown in Table 3. The most common esophageal replacement method was colonic interposition (53%) followed by gastric transposition (30.9%), gastric tube transposition (9.6%).

Discussion

The present study revealed that there are many different approaches in CI among the Turkish PSs. The main debate was in requirement of endoscopic evaluation of esophagus following CI at the admission. Almost half of the participants stated that they do not perform endoscopy in early period after CI even in symptomatic patients.

Despite there are some studies which investigate the effectiveness of computed tomography, endoscopic ultrasound and scintigraphy, upper gastrointestinal tract endoscopy remains the gold standard to evaluate caustic injury of the esophagus (1,3,9,10). Endoscopy is also accepted as an important tool for prediction of prognosis and management and it reduces length of hospital stay in children without esophageal burn (1,3). Lamireau et al. (11) and Betalli et al. (12) reported that no severe esophageal injury or esophageal stenosis were occurred in asymptomatic children in their series and they argued endoscopy may not be necessary in these patients.

Aforementioned studies suggested performing endoscopy in all symptomatic patients (11,12). Interestingly, in the present study, 46 participants (43%) stated that they do not perform endoscopy in any patients but only children who has symptomatic esophageal stricture in follow-up period. These participants' approach was nil by mouth and intravenous fluid replacement until patient's symptoms such as drooling resolved.

Endoscopy timing is also a controversial issue in CI (1). There are no controlled studies which compare early (within first 24-48 hours) and late (48-96 hours) endoscopy (1). Zargar et al. (8) reported that delayed endoscopy at 48-96 hours after ingestion is safe and they reported no complication. However, current studies suggest that performing endoscopy early in CI is safe and complication concerns such as perforation during endoscopy consist on no scientific reasons (3,9,13). Endoscopy also identify patients without esophageal burn who can be discharged, therefore it may prevent prolongation of unnecessary hospitalization (3,14). Abbas et al. (14) reported that early endoscopy reduces length of hospital stay and treatment cost in a nationwide study (14). In the present study, 51 (85%) of participants who perform endoscopy in the first apply, preferred performing endoscopy first 48 hours.

Prognosis of CI has been found related to findings in endoscopic evaluation (1,2,15). Grade 1 and 2A esophageal burns rarely causes esophageal strictures (2,15). Patients with Grade 2B and Grade 3 esophageal burns develop esophageal stricture formation 70-100% of the cases (1). Additionally, degree of the esophageal injury at endoscopy was found related to systemic complications and these findings may indicate emergency surgery (9).

The routine use of antibiotics is another controversial issue in CI management (1). In the literature, there is no strong evidence suggesting that antibiotic using reduces esophageal stricture formation (1,3,16,17). Hugh and Kelly (3) suggested that broad-spectrum antibiotics should be given all patients with second or third degree esophageal burns (3). In a comprehensive review,

Table 3. Participants preference in esophageal dilation

Dilation method	Fluoroscopy usage during the procedure	Topical agent application	Patient selection in topical agent application Total answer: 58
Rigid dilator with guide n=61 (57.5%)	No n=35 (33%)	No n=64 (60.4%)	Recurrent esophageal strictures n=51 (88%)
Balloon dilation n=61 (57.5%)	Routine n=51 (48.1%)	Steroids n=41 (38.7%)	At first esophageal dilation procedure n=4 (7%)
Rigid dilator without guide n=9 (8.5%)	In particular cases n=20 (18.9%) (History of complicated dilation, under one year of age and first dilation)	MMC n=15 (14.2%)	At first endoscopy following CI n=3 (5%)
Esophageal stent n=4 (3.8%)			

Abbreviation: CI: Caustic ingestion, MMC: Mitomycin-C

Bird et al. (1) recommended using antibiotics for children who are using steroids for airway damage and suspected mediastinal and lung involvement. In this survey, seventy-one (67%) of the participants declared that they do not use antibiotics routinely.

Based on their potential to decrease inflammation and fibrosis; corticosteroids are used for prevention of esophageal stricture development in CI (18). However, steroids have been reported ineffective to prevent stricture formation in several studies (18–20). Steroid usage has been reported to benefit patients with airway involvement, such as larynx edema, and it should be administered in these cases rather than all patients with CI (9,18,20). The present study reveal that 16 of participants (15%) use steroids routinely in CI.

Esophageal strictures are the most common late complication after CI (1). Surgical treatment of the esophageal strictures in children has evolved to non-surgical treatments (esophageal bougienage, balloon dilation) by years. (21). There is still no consensus regarding to use of esophageal dilation technique (22). In a meta-analysis, Josino et al. (23) compared esophageal bougienage (Savary dilator) and balloon dilation in benign esophageal strictures and they reported no differences between two techniques in terms of effectivity and complications. In this survey, the most preferred techniques were rigid dilator with guide-wire and balloon dilation. Rigid dilator without guide-wire and stent were preferred by some participants (8.5% and 3.8% respectively).

Local use of corticosteroids such as triamcinolone and betamethasone may be performed in esophageal strictures during the dilation procedure (24–26). Kochhar and Makharia (27) reported outcomes of topical steroid injection in 29 patients who suffer from esophageal strictures due to CI. According to their study, steroid injection reduces number of dilation and improves dysphagia scores (27). Camargo et al. (28) compared saline versus triamcinolone injection in caustic esophagus strictures in their randomized controlled study and found no difference between the groups in dilation number and dysphagia scores. However, larger luminal diameter obtained in steroid group significantly (28). Mitomycin-C (MMC) is another agent that can be used in esophageal strictures based on its property of inhibiting fibroblast proliferation (29). Ghobrial and Eskander (30) reported that MMC application associated with more symptomatic and endoscopic improvement and lower numbers of dilation requirement compared to control group in refractory caustic-induced long segment esophageal strictures. Despite encouraging and promising reports in both triamcinolone and MMC usage in esophageal strictures, definition of the refractory stenosis, patient selection, application doses of both agent, number of applications have been reported differently in the literature (24,27,30–32).

Although the main approach is preserving patient's own esophagus in the management of esophageal strictures, esophageal replacement may be unavoidable in particular patients (33). Esophageal replacement traditionally can be performed by colonic or jejunal interposition, gastric tube interposition, gastric transposition (34,35). None of these methods are perfect and behave like a native esophagus (34). While colonic interposition is associated with higher risk of redundancy, anastomosis leakage and stricture, gastric transposition has higher respiratory morbidity and delayed gastric emptying (35). In the present study, the most preferred esophageal replacement method was colonic interposition, followed by gastric transposition and gastric tube interposition.

Study Limitations

This study has several limitations. Response bias may significantly influence the results, as the questionnaire was distributed to members of the Turkish Association of Pediatric Surgery, potentially skewing responses toward surgeons who are more engaged in academic meetings. Additionally, the survey was not sent to pediatric gastroenterologists, which represents another limitation.

Conclusion

There are many controversial issues in CI. Although some studies on CI management have been published, a clear algorithm in CI management has not established yet. Clinicians tend to determine different follow-up and treatment algorithms based on customs and their clinical experience as it may be seen in the present study. Prospective controlled studies are required to reach a consensus.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the Human Research Ethics Committee of Ankara University Faculty of Medicine (date: 26.03.2020, decision no.: İ3-182-20).

Informed Consent: The study did not include patients, patient consent was not obtained.

Footnotes

Authorship Contributions

Surgical and Medical Practices: S.S., D.İ., G.G., U.A., Concept: S.S., D.İ., E.E., Design: E.E., G.G., A.M.Ç., Data Collection and/or Processing: D.İ., U.A., Analysis and/or Interpretation: D.İ., A.M.Ç., U.A., Literature Search: D.İ., E.E., A.M.Ç., U.A., Writing: S.S., D.İ., U.A.

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References

- Bird JH, Kumar S, Paul C, Ramsden JD. Controversies in the management of caustic ingestion injury: an evidence-based review. *Clin Otolaryngol*. 2017;42:701-708.
- Chirica M, Resche-Rigon M, Bongrand NM, Zohar S, Halimi B, Gornet JM, Sarfati E, Cattani P. Surgery for caustic injuries of the upper gastrointestinal tract. *Ann Surg*. 2012;256:994-1001.
- Hugh TB, Kelly MD. Corrosive ingestion and the surgeon. *J Am Coll Surg*. 1999;189:508-522.
- Zargar SA, Kochhar R, Nagi B, Mehta S, Mehta SK. Ingestion of strong corrosive alkalis: spectrum of injury to upper gastrointestinal tract and natural history. *Am J Gastroenterol*. 1992;87:337-341.
- Çam H, Kıray E, Taştan Y, Özkan HÇ. İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi Çocuk Sağlığı ve Hastalıkları Anabilim Dalı Acil Servisinde izlenen zehirlenme olguları Orijinal Araştırma. *Türk Pediatri Arşivi*. Aralık 2003;38.
- Kucuk G, Gollu G, Ates U, Cakmak ZA, Kologlu M, Yagmurcu A, Aktug T, Dindar H, Cakmak AM. Evaluation of esophageal injuries secondary to ingestion of unlabeled corrosive substances: pediatric case series. *Arch Argent Pediatr*. 2017;115:e85-e88.
- Boskovic A, Stankovic I. Predictability of gastroesophageal caustic injury from clinical findings: is endoscopy mandatory in children? *Eur J Gastroenterol Hepatol*. 2014 May;26(5):499-503.
- Zargar SA, Kochhar R, Mehta S, Mehta SK. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc*. 1991;37:165-169.
- Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: a comprehensive review. *World J Gastroenterol*. 2013;19:3918-3930.
- Bonnici KS, Wood DM, Dargan PI. Should computerised tomography replace endoscopy in the evaluation of symptomatic ingestion of corrosive substances? *Clin Toxicol (Phila)*. 2014;52:911-925.
- Lamireau T, Rebouissoux L, Denis D, Lancelin F, Vergnes P, Fayon M. Accidental caustic ingestion in children: is endoscopy always mandatory? *J Pediatr Gastroenterol Nutr*. 2001;33:81-84.
- Betalli P, Falchetti D, Giuliani S, Pane A, Dall'Oglio L, de Angelis GL, Caldore M, Romano C, Gamba P, Baldo V; Caustic Ingestion Italian Study Group. Caustic ingestion in children: is endoscopy always indicated? The results of an Italian multicenter observational study. *Gastrointest Endosc*. 2008;68:434-439.
- Bonavina L, Chirica M, Skrobic O, Kluger Y, Andreollo NA, Contini S, Simic A, Ansaloni L, Catena F, Fraga GP, Locatelli C, Chiara O, Kashuk J, Coccolini F, Macchitella Y, Mutignani M, Cutrone C, Poli MD, Valetti T, Asti E, Kelly M, Pesko P. Foregut caustic injuries: results of the world society of emergency surgery consensus conference. *World J Emerg Surg*. 2015;10:44.
- Abbas A, Brar TS, Zori A, Estores DS. Role of early endoscopic evaluation in decreasing morbidity, mortality, and cost after caustic ingestion: a retrospective nationwide database analysis. *Dis Esophagus*. 2017;30:1-11.
- Cheng HT, Cheng CL, Lin CH, Tang JH, Chu YY, Liu NJ, Chen PC. Caustic ingestion in adults: the role of endoscopic classification in predicting outcome. *BMC Gastroenterol*. 2008;8:31.
- Keh SM, Onyekwelu N, McManus K, McGuigan J. Corrosive injury to upper gastrointestinal tract: Still a major surgical dilemma. *World J Gastroenterol*. 2006;12:5223-5228.
- Ramasamy K, Gumaste W. Corrosive ingestion in adults. *J Clin Gastroenterol*. 2003;37:119-124.
- Fulton JA, Hoffman RS. Steroids in second degree caustic burns of the esophagus: a systematic pooled analysis of fifty years of human data: 1956-2006. *Clin Toxicol (Phila)*. 2007;45:402-408.
- Anderson KD, Rouse TM, Randolph JG. A controlled trial of corticosteroids in children with corrosive injury of the esophagus. *N Engl J Med*. 1990;323:637-640.
- Pelclová D, Navrátil T. Do corticosteroids prevent oesophageal stricture after corrosive ingestion? *Toxicol Rev*. 2005;24:125-129.
- Weintraub JL, Eubig J. Balloon catheter dilatation of benign esophageal strictures in children. *J Vasc Interv Radiol*. 2006;17:831-835.
- Youn BJ, Kim WS, Cheon JE, Kim WY, Shin SM, Kim IO, Yeon KM. Balloon dilatation for corrosive esophageal strictures in children: radiologic and clinical outcomes. *Korean J Radiol*. 2010;11:203-210.
- Josino IR, Madruga-Neto AC, Ribeiro IB, Guedes HG, Brunaldi VO, de Moura DTH, Bernardo WM, de Moura EGH. Endoscopic Dilatation with Bougies versus Balloon Dilatation in Esophageal Benign Strictures: Systematic Review and Meta-Analysis. *Gastroenterol Res Pract*. 2018;2018:5874870.
- Kochhar R, Poornachandra KS. Intralesional steroid injection therapy in the management of resistant gastrointestinal strictures. *World J Gastrointest Endosc*. 2010;2:61-8.
- Méndez-Nieto CM, Zarate-Mondragón F, Ramírez-Mayans J, Flores-Flores M. Topical mitomycin C versus intralesional triamcinolone in the management of esophageal stricture due to caustic ingestion. *Rev Gastroenterol Mex*. 2015;80:248-54. English, Spanish.
- Ramboer C, Verhamme M, Dhondt E, Huys S, Van Eygen K, Vermeire L. Endoscopic treatment of stenosis in recurrent Crohn's disease with balloon dilatation combined with local corticosteroid injection. *Gastrointest Endosc*. 1995;42:252-5.
- Kochhar R, Makharia GK (2002) Usefulness of intralesional triamcinolone in treatment of benign esophageal strictures. *Gastrointestinal Endoscopy*. 2002;56:8290-834.
- Camargo MA, Lopes LR, Grangeia Tde A, Andreollo NA, Brandalise NA. O uso de corticoesteróides após dilata o esofágica em pacientes portadores de estenose por substâncias corrosivas: estudo prospectivo, randomizado e duplo-cego [Use of corticosteroids after esophageal dilations on patients with corrosive stenosis: prospective, randomized and double-blind study]. *Rev Assoc Med Bras (1992)*. 2003;49:286-292. Portuguese.
- Berger M, Ure B, Lacher M. Mitomycin C in the therapy of recurrent esophageal strictures: hype or hope? *Eur J Pediatr Surg*. 2012;22:109-116.
- Ghobrial CM, Eskander AE. Prospective study of the effect of topical application of Mitomycin C in refractory pediatric caustic esophageal strictures. *Surg Endosc*. 2018;32:4932-4938.
- El-Asmar KM, Hassan MA, Abdelkader HM, Hamza AF. Topical mitomycin C can effectively alleviate dysphagia in children with long-segment caustic esophageal strictures. *Dis Esophagus*. 2015;28:422-7.
- Bartel MJ, Seeger K, Jeffers K, Clayton D, Wallace MB, Raimondo M, Woodward TA. Topical Mitomycin C application in the treatment of refractory benign esophageal strictures in adults and comprehensive literature review. *Dig Liver Dis*. 2016;48:1058-1065.
- Soccorso G, Parikh DH. Esophageal replacement in children: Challenges and long-term outcomes. *J Indian Assoc Pediatr Surg*. 2016;21:98-105.
- Reinberg O. Esophageal replacements in children. *Ann N Y Acad Sci*. 2016;1381:104-112.
- Loukogeorgakis SP, Pterro A. Replacement surgery for esophageal atresia. *Eur J Pediatr Surg*. 2013;23:182-90.