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ORIGINAL ARTICLE

Does esophageal wall thickness on computed tomography predict response to endoscopic dilatation in patients with corrosive esophageal strictures?

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computed tomography scan, corrosive, dilatation, endoscopy.

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Abstract

Background and Aim: To evaluate the role of esophageal wall thickness (EWT) on computed tomography (CT) in predicting response to endoscopic dilatation of corrosive esophageal strictures.
Methods: This was a retrospective study. A review of the records of patients who underwent endoscopic dilatation of esophageal strictures between January 2010 and December 2017 was performed. Patients who had a CT evaluation prior to dilatations were included. CT-EWT was measured at the maximum visible point. Clinical details and endoscopic dilatation parameters were recorded. Technical success, clinical success, and recurrent and refractory strictures were recorded. CT-EWT and the clinical parameters were evaluated regarding their role in predicting the number of dilatations required to achieve technical and clinical success.
Results: A total of 250 patients underwent endoscopic dilatations during the study period; 84 patients underwent thoracoabdominal CT. Complete clinical, endoscopic, CT data and follow up were available for 64 patients. There were 36 males. The median age was 30 years (range, 14–70 years). A total of 750 dilatations were performed. The median number of dilatations required to achieve technical success was 8.5 (range, 1–51). Dilatations were performed after a median period of 3 months (range, 1–40). Median CT-EWT was 7 mm (range, 3–22). On univariate, as well as multivariate, analysis, CT-EWT and the clinical parameters were found to be poor predictors of the number of dilatations required to achieve technical and clinical success.
Conclusion: CT-EWT has no additional role in predicting response to the endoscopic dilatation of corrosive esophageal strictures.

Introduction

Corrosive ingestion is one of the important gastrointestinal emergencies associated with significant morbidity and mortality. The severity of damage depends on the type of corrosive agent, volume, and the duration of contact. The most important aspect of management of these patients is the prevention of stricture.[1] Unlike other benign strictures, corrosive strictures are frequently multiple, tight, long segment, and eccentric, and therefore, their management is more difficult than the other benign strictures.[2] Currently, the gold-standard tool in the assessment of mucosal damage and prediction of prognosis is esophagogastroduodenoscopy (EGD) performed within the first 12 h of the caustic ingestion.[3] However, due to its invasive nature, complications like bleeding or perforation may occur.[4] Moreover, many patients may not report to the emergency department before a substantial period has elapsed. In these patients, EGD is not recommended as it is more likely to produce complications. Surgery in patients with corrosive esophageal strictures carries significant morbidity and mortality.[5] Endoscopic dilatation is the treatment of choice. However, the response to endoscopic balloon dilatation is variable.[6] Several investigators have attempted to study the predictors of success of endoscopic dilatations.[1,7,8] One of the important and noninvasive techniques in this evaluation is a thoracoabdominal computed tomography (CT). CT has the advantage of easy availability, noninvasive nature, and applicability regardless of the time elapsed since corrosive ingestion. However, only one study has evaluated the role of CT in predicting response to endoscopic treatment.[6] In this study, we evaluated the role of CT in predicting the success of endoscopic treatment of esophageal corrosive strictures.

Methods

A retrospective review of patients who were admitted to a tertiary care referral center for the management of corrosive

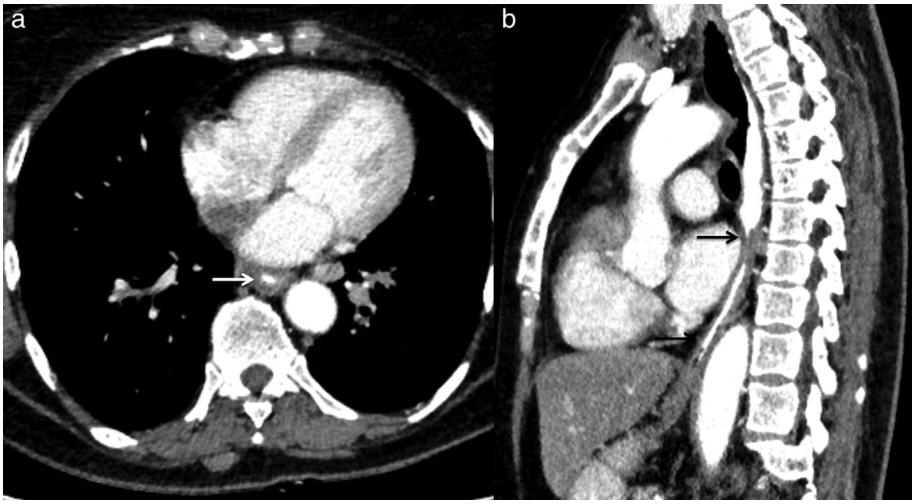

Figure 1 Axial computed tomography image (a) shows circumferential mural thickening of the lower thoracic esophagus (arrow, maximum thickness was 8 mm). The coronal image (b) from the same study shows the craniocaudal extent of mural thickening (arrows).

strictures between January 2010 and December 2017 was performed. During this period, CT of the chest and upper abdomen was performed for delineating features of caustic cicatrization and to assess wall thickness for predicting response to dilatation. All CTs were performed before starting dilatation or within a week of first dilatation. CT was performed on a multirow-detector CT scanner (Siemens, Erlangen, Germany, GE Healthcare, Chicago, Illinois, USA, or Philips Healthcare, Best Netherlands) following administration of oral and intravenous contrast. Esophageal wall thickness (EWT) was measured at the site of maximum visible thickness (Fig. 1). Esophagography with nonionic oral contrast was used to assess the number of strictures.

Clinical details. Information regarding the type and volume of corrosive, as well as the time elapsed before the presentation, were recorded. The intention of corrosive ingestion, the presence of fasting status (defined as the last oral intake 6 h before ingestion of corrosive), the influence of alcohol, upper gastrointestinal bleeding, placement of the nasogastric tube, and the associated gastric injury were also recorded.

Endoscopic management. Dilatation was performed using Savary Gilliard dilators (Cook Medical Inc., Winston-Salem, NC, USA) or Eder Puestow dilators (Key Med Inc., Essex, UK). These were passed over a guide wire placed with the help of an endoscope. Fluoroscopy was used in difficult situations. Initial caliber (8–12 mm) of dilators, as well as the number of dilators passed during each session, was determined by the tightness of stricture. Dilatation was performed at weekly intervals with the aim of achieving dilatation up to 15 mm (technical success) and complete resolution of dysphagia (clinical success). Repeat dilatations were performed thereafter whenever dysphagia recurred. After each dilatation session, patients were observed for any complication such as bleeding or perforation. A refractory stricture was defined as the failure to achieve successful dilatation up to a 14-mm diameter after five sessions performed every 2 weeks.[9] When there was an inability to maintain a patent lumen for more than 4 weeks after a successful dilatation to 14 mm, the recurrence of stricture was labeled.[9]

Statistical analysis. Continuous variables were expressed as medians with a range. The categorical variables were expressed as absolute numbers and percentages. For data analysis, Pearson's correlation coefficient was used. Multiple regression analysis was used to determine the independent association between study variables and sessions required for adequate dilatation and other endoscopic response parameters. A *P*-value of less than 0.05 was considered statistically significant.

Results

Patient characteristics. During the study period, 250 patients were treated endoscopically for corrosive strictures; 84 patients underwent thoracoabdominal CT. Complete clinical, endoscopic, CT data, and follow up was available for 64 patients.

There were 36 males and 28 females. The median age was 30 years (range, 14–70 years). The clinical characteristics at presentations are shown in Table 1.

Response to endoscopic dilatation and CT-EWT. Technical success was achieved in 57 patients (89%). Clinical success was achieved in 59 patients (92.18%). The median number of sessions required to achieve adequate dilatation was 8.5 (range, 1–51). Recurrent strictures were noted in 37 patients (57.81%). Refractory strictures were noted in 43 (67.18%). Complications following dilatation developed in five patients. All these patients were managed conservatively.

Median CT-EWT was 7 mm (range, 3–22 mm). Thirty-three patients (51.5%) had CT-EWT >8 mm. There was no correlation between age, gender, type or volume of corrosive, number of strictures, fasting state, alcohol, upper gastrointestinal (GI) bleed, months elapsed before dilatation, and the number of sessions required for adequate dilatation ($P > 0.05$). On univariate

Table 1 Characteristics of patients with corrosive esophageal injury

Findings	Number (total n = 48)
Type of corrosive	Acid (n = 48); alkali (n = 16)
Intention of corrosive intake	Accidental (n = 35); suicidal (n = 25); homicidal (n = 4)
Median volume of corrosive intake (mL)	30 (range, 5–300)
RT lavage	n = 23
Upper gastrointestinal bleed	n = 26
Influence of alcohol	n = 15
Fasting state	n = 38
Number of strictures	One (n = 46); two (n = 12); three (n = 5); four (n = 1)
Median no. of months before dilatation	3 (range, 1–40)
Total no. of dilatations in 48 patients	290
Associated gastric injury	15

RT, Ryle's tube.

analysis, as well as multivariate analysis, sessions required for adequate dilatation showed poor correlation with maximal EWT (Fig. 2). Similarly, CT-EWT did not predict technical or clinical success, refractory or recurrent strictures, and complications (Fig. 3).

Discussion

Corrosive ingestion, either accidental or suicidal, is common in developing parts of the world.[10] It carries significant morbidity that accrues primarily from the strictures that form after corrosive ingestion. Corrosive esophageal strictures are often multiple, tight, long segment, and eccentric.[2] All these characteristics make these strictures extremely difficult to manage.[8] Surgery was considered the treatment of choice in the past; however, it has significant morbidity and mortality.[5] Endoscopic dilatation is now the favored initial treatment in corrosive esophageal strictures.[6] However, the success rate is variable.[6] Investigators have attempted to predict the success of endoscopic treatment taking several clinical and endoscopic parameters into consideration.[1,7–9] One study attempted to evaluate corrosive esophageal strictures on CT and predict the response to endoscopic dilatation.[6] However, there are sparse data with a small number of patients.

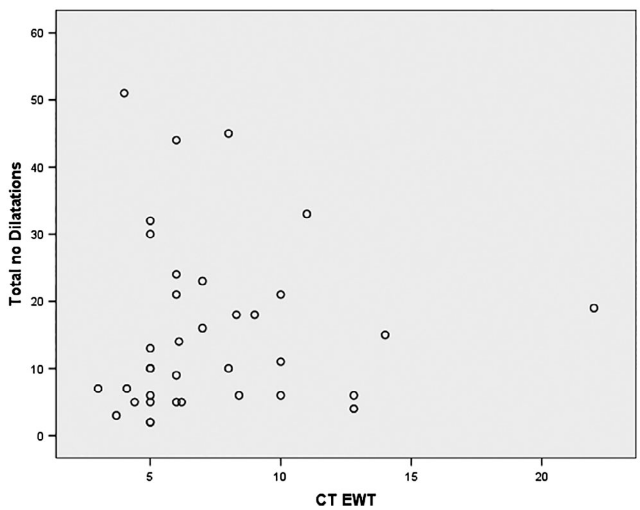

Figure 2 Scatter plot shows the distribution of number of sessions of endoscopic dilatation according to computed tomography esophageal wall thickness (CT-EWT).

In the present study, the evaluation of CT-EWT did not correlate with the endoscopic response parameters, including technical or clinical success and the number of dilatations required to achieve clinical success. Furthermore, there was no correlation between the CT-EWT and the complications of endoscopic treatment. Our results are different from those shown by Lahoti *et al*., who found maximum EWT to be a good predictor of response to endoscopic dilatation.[6] However, there was no correlation between average EWT and the number of dilatations required to achieve clinical success in the study by Lahoti *et al*. Similar to the results of our study, none of the clinical parameters predicted response to endoscopic treatment in the study by Lahoti *et al*. The difference in results and inferior performance of CT scan assessment may be due to the larger number of patients in our study. This may also be related to the difference in the time period after which the patients were assessed, although these data were not presented by Lahoti *et al*.

In another study by Ryu *et al*., the accuracy of CT grading of corrosive esophageal injury in predicting the development of stricture was assessed.[1] The authors found a moderately higher sensitivity and specificity of the CT grading system compared to the endoscopic grading. We cannot compare our results with this study as we performed CT after a variable period of time since the corrosive ingestion. Moreover, we did not attempt to compare CT findings directly with the endoscopic findings. In a similar study, Motlagh *et al*. evaluated the diagnostic accuracy of CT scan in the detection of upper gastrointestinal tract injury following caustic ingestion.[11] The authors found moderate and fair agreement between CT scan and endoscopy regarding grades of esophageal and gastric injury, respectively. These studies attempted to evaluate the role of CT assessment in acute corrosive injury, while in our study, the aim was to predict the response to endoscopic treatment based on CT-EWT in any patient at the time of admission regardless of the time elapsed following corrosive ingestion.[1,11]

There were a few limitations to our study. Although ours is the largest study evaluating the role of CT assessment in predicting the response to endoscopic treatment, the number is still small. A larger number of patients will allow a more definitive interpretation. We did not correlate the endoscopic finding with the CT findings. Although our patients did not strictly present in the acute stage, a correlation of CT findings and endoscopy would have been ideal.

In conclusion, the present study did not find any additional role of CT-EWT in predicting the response to endoscopic dilatation. None of the other clinical parameters correlated with the response to endoscopic dilatation. The results of our study imply that future research is required in this field so that we can prognosticate our patients at the time they present to us for endoscopic dilatation.

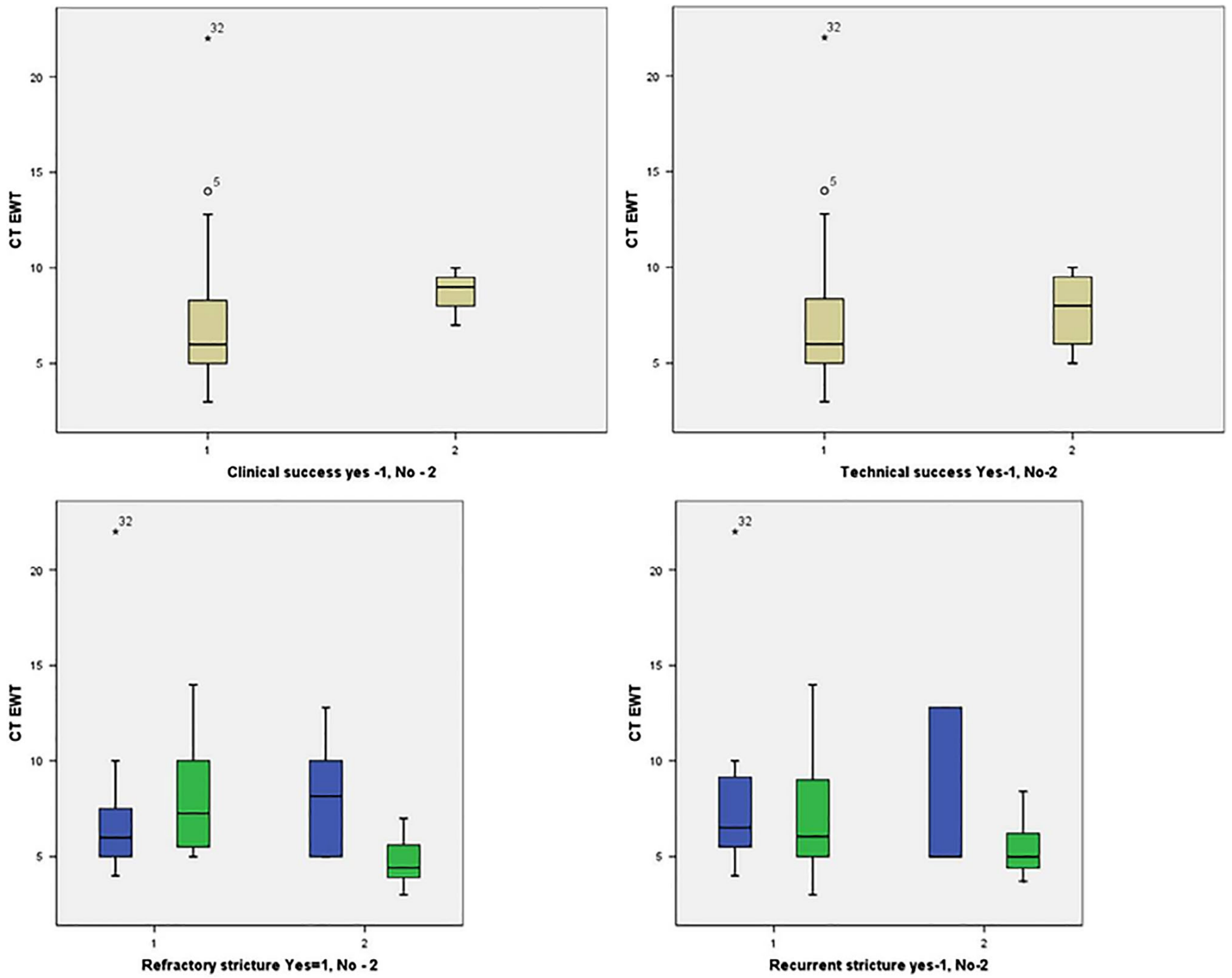

Figure 3 Box plot shows clinical success, technical success, and refractory and recurrent stricture according to computed tomography esophageal wall thickness (CT-EWT). CT-EWT was not found to be significantly different for any of these groups. (■), Male; (■), female.

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