The Role of Second-look Endoscopy in Severe Esophageal Caustic Injury

Le Puo-Hsien1,2, Seak Chen-June1,4, Chiu Cheng-Tang1,4, Chen Tsung-Hsing1,4, Kang Shih-Ching2 and Cheng Hao-Tsai1,4,6*

1Department of Gastroenterology and Hepatology, Linkou Chang Gung Memorial Hospital, Taoyuan, Taiwan
2Liver Research Center, Linkou Chang Gung Memorial Hospital, Taoyuan, Taiwan
3Department of Emergency Medicine, Linkou Chang Gung Memorial Hospital, Taoyuan, Taiwan
4Chang Gung University, College of Medicine, Taoyuan, Taiwan
5Department of Trauma and Emergency Surgery, Linkou Chang Gung Memorial Hospital, Taoyuan, Taiwan
6Graduate Institute of Clinical Medicine, College of Medicine, Chang Gung University, Taoyuan, Taiwan

*Corresponding author: Cheng Hao-Tsai, Department of Gastroenterology and Hepatology, Linkou Chang Gung Memorial Hospital, Chang Gung University College of Medicine, No.5 Fu-Shin Street, Taoyuan 333, Taiwan, Republic of China, Tel: +886-3-3281200; Fax: +886-3-3272236; E-mail: hautai@adm.cgmh.org.tw

Received date: July 18, 2017; Accepted date: August 02, 2017; Published date: August 09, 2017

Copyright: © 2017 Puo-Hsien Le, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Severe caustic ingestion often leads to multiple complications and high mortality rate. Esophagogastroduodenoscopy is recommended during the first 24 hours for severity and extent evaluation, but it seems insufficient to guide further managements in severe caustic injury patients due to rapid progression and variable clinical conditions. Therefore, we tried to evaluate the safety and role of second-look endoscopy in these patients in 1-2 weeks later.

We retrospectively collected severe esophageal caustic injury (grade 2b, 3a, 3b) adults with and without second-look endoscopy in subacute stage (6th-14th days after caustic injury) in Linkou Chang Gung Memorial Hospital during 2011/1-2014/11. They were divided into two endoscopy groups and second-look endoscopic group according to the patients with second-look endoscopy or not. They were further matched with the same cause of caustic injury, corrosive properties, injury grading, and then selected with Excel RAND function. There were 26 patients in both groups.

The average timing of second-look endoscopy was 10.23 ± 3.166 (mean ± SD) days after caustic ingestion. The hospital stay was significantly shorter in the second-look endoscopy group (24.92 ± 17.50 days, 54.38 ± 43.73 days, P=0.002). However, the complication rate was not statistically significant between these two groups.

In conclusion, second-look endoscopy is safe and might shorten the hospital stay. However, prospective, randomized and larger sample size studies are needed to support the finding.

Keywords: Caustic injury; Caustic ingestion; Second-look endoscopy

Introduction

Caustic ingestion brings severe complications and heavy burden to health care system [1,2]. The severity of damage depends on corrosive properties, amount, concentration, physical form and duration of contact with the mucosa [3,4]. In terms of severity evaluation, symptoms and signs alone are unreliable [5]. Early esophagogastroduodenoscopy (EGD) is recommended within the 24-48 hours to evaluate the severity and extent of damage, establish prognosis, and guide therapy [6-8]. Many endoscopic grading systems have been proposed [8-10].

However, Zargar’s classification is mostly widely used and accepted: grade 0 is normal; grade 1 is mucosal edema and hyperemia; grade 2a is superficial ulcers, bleeding, exudates; grade 2b is deep focal or circumferential ulcers; grade 3a is focal necrosis; and grade 3b is extensive necrosis [8]. At least 70% patients with grade 2b and 3a injury leads to esophageal stricture [8,11]. The patients with grade 3b injury have 65% early mortality rate, and most of them need esophageal resection with colonic or jejunal interposition [8,11]. Therefore, the patients with severe esophageal caustic injury (grade 2b, 3a, 3b) have variable clinical condition, rapid progression and poor outcome.

Recent study mentioned conservative management of severe caustic injury during acute phase leads to superior long-term nutritional and quality of life outcome [12]. In this way, precisely clinical decision making, esp. timing of surgical intervention is critical.

Only once endoscopic exam within 24-48 hours seems insufficient to guide the treatment because the endoscopic grade at that time not actually reflects the most severe status, especially in alkali ingestion. Some researches mentioned it’s safe to repeat endoscopy up to 3 weeks after caustic injury in expert hands [13,14]. Although upper gastrointestinal series plays the role in clinical evaluation, it’s not as precise as endoscopic examination.

Therefore, some clinical physicians prefer second-look endoscopy to help them deciding the timings of initiating feeding, operation, and etc. in sub-acute stage (6th-14th days after caustic injury). No study mentioned the role of second-look endoscopy in severe esophageal caustic injury patients till now. We try to clarify its safety and benefit.

J Gastrointest Dig Syst, an open access journal
ISSN:2161-069X
Volume 7 • Issue 4 • 1000518
DOI: 10.4172/2161-069X.1000518
Materials and Methods

Under the approval of the Chang Gung Medical Foundation Institutional Review Board (104-2662B), we retrospectively collected severe caustic ingestion (Zagar grade 2, 3a, 3b) adults from electronic endoscopic report system in Linkou Chang Gung Memorial Hospital during 2011/01-2014/11. The patients who had unknown corrosive properties or no first endoscopy result within 24 hours were excluded. The rest patients were dived into once endoscopic group (only once EGD within first 24 hours) and second-look endoscopy group (first EGD within 24 hours of caustic ingestion and second EGD during 6th-14th days). The second-look endoscopy was performed when patients had improved clinical condition, including less pain and stable vital sign, and we considered to try oral intake to confirm the endoscopic grade in subacute stage. If the Zagar’s score of second-look endoscopy was the same or improved, patients would go ahead to starting intake. On the other hand, surgical evaluation and prolonged fasting were indicated. In once endoscopic group, there was much higher proportion of the patients with Zagar grade 3a, 3b, and they could not receive send-look endoscopy due to worse clinical condition in subacute stage. Therefore, we matched these two group patients with the same Zagar grading, cause of caustic injury (suicide or accident), corrosive properties and injury grading in maximum case number, and then selected by Excel RAND function if we got several candidates.

The initial managements, including stabilizing vital sign, intravenous fluid and nutrition support, intensive care unit admission, fasting, serial chest and abdominal film follow-up were the proved in all patients. The indications for emergency surgery were clinical signs or image evidence of perforation, mediastinitis, peritonitis or highly suspected impending perforation by clinicians or endoscopic finding. Receiving second-look endoscopy or not and the timing were decided by clinical physicians, patients’ agreements, clinical symptoms and signs in subacute stage. All the endoscopic exams were performed with room air by the same experienced endoscopic doctor.

We analyzed the hospital stay duration, systemic complications (aspiration pneumonia, respiratory failure, disseminated intravascular coagulation (DIC), acute hepatitis, acute kidney injury), gastrointestinal (GI) complications (perforation, fistula formation, bleeding, stricture) and the need of further treatment (dilatation, esophagectomy) to evaluate the safety and benefits of second-look endoscopy in these cases.

We used Microsoft Excel 2013 RAND function to select patients after matched the same cause of caustic injury, corrosive properties and endoscopic severity grading. The χ² test was used for group comparisons involving binary data and independent samples. Numerical data were evaluated by Student t test. The results were considered to indicate a statistically significant difference when P<0.05. Statistical calculations were performed using SPSS, 18.0 software (SPSS, Inc., Chicago, IL, USA).

Results

In this study, we finally enrolled 52 severe esophageal caustic injury (Zagar grade 2b, 3a, 3b). In these patients, suicide was the major cause of caustic ingestion (84.62%), and acid ingestion was more than alkali ingestion (57.69%, 42.31%). The average age was 50.48 ± 19.08 years old, and men were predominant (51.92%, 48.08%). The distribution of endoscopic severity were grade 2b (11.54%), grade 3a (23.08%) and grade 3b (65.38%). There were 26 patients in each group.

As we showed in Table 1, the cause of caustic injury (suicide/accident), corrosive property and endoscopic severity were matched equally in both groups, but the age of second-look endoscopy group is older than once endoscopy group (55.81 ± 17.45 y/o, 45.15 ± 19.47 y/o, P=0.043). All patients in the study had first time endoscopic exam within 24 hours, and the average timing of second-look endoscopy was 10.23 ± 3.17 days after caustic ingestion in second-look endoscopy group.

| Characteristics | Overall (n=52) | Once endoscopy (n=26) | Second-look endoscopy (n=26) | P-value |
|-----------------|---------------|-----------------------|-----------------------------|---------|
| Timing of second-look endoscopy (days after event) | - | - | 10.23 ± 3.17 | - |
| Sex | - | - | - | 0.405 |
| Male | 27(51.92%) | 12(46.15%) | 15(57.69%) | - |
| Female | 25 (48.08%) | 14(53.85%) | 11 (42.31%) | - |
| Age (y/o) | 50.48 ± 19.08 | 45.15 ± 19.47 | 55.81 ± 17.45 | 0.043* |
| Suicide | 44(84.62%) | 22(84.62%) | 22(84.62%) | 1 |
| Corrosive property | - | - | - | - |
| Alkali | 22(42.31%) | 11(42.31%) | 11(42.31%) | 1 |
| Acid | 30(57.69%) | 15(57.69%) | 15(57.69%) | 1 |
| Endoscopic severity | - | - | - | - |
| Grade 2b | 6(11.54%) | 3(11.54%) | 3(11.54%) | 1 |
| Grade 3a | 12(23.08%) | 6(23.08%) | 6(23.08%) | 1 |
| Grade 3b | 34(65.38%) | 17(65.38%) | 17(65.38%) | 1 |

Data are presents as mean ± standard deviation or number (%) of subjects

Table 1: Demographic features analysis.

In Table 2, we could find the overall patients had 65.38% GI complication rate and 67.31% systemic complication rate. 59.62% patients needed esophageal balloon dilatation and 25% received esophagectomy due to perforation, progressive endoscopic severity score with highly suspected impending rupture.

The overall mortality rate was 5.77%. The average hospital stay was 39.65 ± 36.18 days, but it was significantly shorter in the second-look endoscopy group (24.92 ± 17.50 days, 54.38 ± 43.73 days, P=0.002). The systemic (65.38%, 69.23%, P=0.768) and GI (53.85%, 76.92%, P=0.080) complication rates seemed lower in this group, but not reached statistically significant.

The two cases with perforation in second-look endoscopy group were not procedure related according to clinical symptoms and serial chest film follow-up. No endoscopy related complications, including fetal arrhythmia, bleeding, pneumomediastinum, pneumoperitoneum, aspiration or respiratory failure was observed during or immediately after endoscopic exam in these patients.
### Table 2: Outcome analysis in once endoscopy and second-look endoscopy groups.

| Diseases                  | Overall       | Once endoscopy (n=26) | Second-look endoscopy (n=26) | P-value |
|---------------------------|---------------|-----------------------|-----------------------------|---------|
| GI complication           | 34(65.38%)    | 20(76.92%)            | 14(53.85%)                  | 0.08    |
| Bleeding                  | 5(9.62%)      | 4(15.38%)             | 1(3.85%)                    | 0.158   |
| Perforation               | 7(13.46%)     | 5(19.23%)             | 2(7.69%)                    | 0.223   |
| Stricture                 | 31(59.62%)    | 17(65.38%)            | 14(53.85%)                  | 0.397   |
| Fistula                   | 0(0.00%)      | 0(0.00%)              | 0(0.00%)                    | 1       |
| Systemic complication     | 35(67.31%)    | 18(69.23%)            | 17(65.38%)                  | 0.768   |
| Respiratory failure       | 16(30.77%)    | 10(38.46%)            | 6(23.08%)                   | 0.229   |
| Aspiration pneumonia      | 18(34.62%)    | 12(46.15%)            | 6(23.08%)                   | 0.08    |
| DIC                       | 6(11.54%)     | 5(19.23%)             | 1(3.85%)                    | 0.083   |
| Acute hepatitis           | 1(1.92%)      | 1(3.85%)              | 0(0.00%)                    | 0.313   |
| Acute kidney injury       | 1(1.92%)      | 0(0.00%)              | 1(3.85%)                    | 0.313   |

**Advanced treatment**

| Characteristics     | Alkali (n=22) | Acid (n=30) | P-value |
|--------------------|---------------|-------------|---------|
| Dilatation         |               |             | 0.397   |
| Operation          | 13(25%)       | 6(23.08%)   | 7(26.92%) | 0.749   |
| Hospital stay (day)| 39.65 ± 36.18 | 54.38 ± 43.73 | 24.92 ± 17.50 | 0.002*  |
| Death              | 3(5.77%)      | 3(11.54%)   | 0(0.00%) | 0.074   |

*Data are presents as mean ± standard deviation or number (%) of subjects; GI: Gastrointestinal; DIC: Disseminated Intravascular Coagulation; *P< 0.05
As far as corrosive property was concerned, acid ingestion group had higher suicide rate (93.33%, 72.72%, P=0.042) in Table 3. It seems to have higher GI and systemic complication rates and longer hospital stay in acid ingestion group, but there was no statistical significance.

Table 3: Demographic features and outcome analysis in alkali and acid ingestion groups.

|                          | Alkali ingestion | Acid ingestion | P-value |
|--------------------------|------------------|----------------|---------|
| Fistula                  | 0(0.00%)         | 0(0.00%)       | -       |
| Systemic complication    | 17(77.27%)       | 18(60.00%)     | 0.19    |
| Respiratory failure      | 6(27.27%)        | 10(33.33%)     | 0.64    |
| Aspiration pneumonia     | 9(40.91%)        | 9(30.00%)      | 0.414   |
| DIC                      | 3(13.64%)        | 3(10.00%)      | 0.685   |
| Acute hepatitis          | 1(4.55%)         | 0(0.00%)       | 0.238   |
| Acute kidney injury      | 0(0.00%)         | 1(3.33%)       | 0.387   |
| Advanced treatment       |                  |                |         |
| Dilatation               | 16(72.73%)       | 15(50.00%)     | 0.099   |
| Operation                | 6(27.27%)        | 7(23.33%)      | 0.746   |
| Hospital stay (day)      | 37.23 ± 20.66    | 41.43 ± 44.55  | 0.683   |
| Death                    | 2(9.09%)         | 1(3.33%)       | 0.379   |

Data are presents as mean ± standard deviation or number (%) of subjects; Abbreviations: GI: Gastrointestinal; DIC: Disseminated Intravascular Coagulation; *P<0.05

As far as corrosive property was concerned, acid ingestion group had higher suicide rate (93.33%, 72.72%, P=0.042) in Table 3. It seems to have higher GI and systemic complication rates and longer hospital stay in acid ingestion group, but there was no statistical significance.

Discussion

Unlike caustic ingestion in children, adults usually ingest strong corrosives with suicidal intent and lead to severe, life-threatening injuries with multiple long-term complications, including stricture, fistula formation and malignancy [7,15]. In the study, we found most caustic injury adults were also suicide intent with acid caustic agents (detergent or insecticides) at middle to older age in Taiwan. Therefore, this kind of injury is heavy burn to family and health care system [16]. How to improve the survival rate, shorten the hospital stay and decrease long-term complications are important issues. There is no specific treatment guideline for caustic ingestion injury because the corrosive property, amount, concentration, physical form, duration of contact with the mucosa, and patients’ comorbidity should be taken into consideration of clinical care and affect the clinical outcome. It’s not difficult to provide general management, including urgent resuscitation with correction of fluid and electrolyte and acid-base abnormalities to every caustic injury patients and immediate surgical exploration in those patients with signs of perforation [17]. How about further individual management in severe caustic injury patients? In such complicated and variable situation, EGD grading is most subject way to evaluate the severity of the injury and then guided the treatment. Therefore, early EGD is generally suggested during the first 24-48 hours after ingestion [6-8], although some doctors thought it might be unnecessary in mild injury [18].

However, the condition of severe caustic injury might change fastly and get worst injury grading after first 24 hours. We need an objective reference to guide further treatment in the subacute stage (6th-14th days), and second-look endoscopy would be the reliable tool.

Although upper gastrointestinal series is alternative, but not objective and comparable to first time endoscopic result. In our study, second-look endoscopy was performed at 10.23 ± 3.17 days after the caustic event to confirm endoscopic grading under stable clinical condition. In this way, hospital stay was shorter without increased the complications. Second-look endoscopy might play the role in shorten hospital stay in the patients with severe caustic injury. The dynamic change of endoscopic severity grade helping clinical physicians to decide the adequate timing of intake might explain the result.

With regard to safety, it was no endoscopic related complication noted in the study. According to previous studies, it was safe up to 96 hours after caustic ingestion, and even dilatation have been performed without consequences from 5 to 15 days after corrosive event. They also mentioned passage of the scope should be limited to the level of the first signs of a circumferential second or third degree esophageal injury to prevent possible adverse event [13,19-22]. Besides, we thought gentle insufflation, delicate manipulation, great caution and carbon dioxide use might further improve the safety and decrease complications.

However, second-look endoscopy could not statistically decrease gastrointestinal and systemic complication rate, the needs of balloon dilatation and surgical intervention, and mortality rate in this study. The severity and extent were mostly destined by initial caustic event and primary management, so second-look endoscopy could not significantly change the outcome. However, it helped clinicians to make more precise therapeutic plan to shorten the hospital stay. It decrease family’s economic burden, and let patients back to family and society earlier.

Conclusions

Second-look endoscopy in subacute stage is safe in severe esophageal caustic injury. It might shorten the hospital stay, but not
improve other clinical outcomes. Because of limited case number and no comparison of twice endoscopic results, we needed prospective, randomized and larger sample size studies to support the finding.

Acknowledgments

This study was supported by the grants from Chang Gung Medical Research Council, Taiwan, Republic of China. There was no any industrial links and affiliations. Thanks for all the colleagues of department of Emergency Medicine department and Gastroenterology and Hepatology to help us caring the patients and collecting the data.

References

1. Yegeane RA, Bashtar R, Bashashati M (2008) Aortoesophageal fistula due to caustic ingestion. Eur J Vasc Endovasc Surg 35: 187-189.
2. Benjamin B, Agueb R, Vuarnesson H, Tranchart H, Bongrand NM, et al. (2016) Tracheobronchial necrosis after caustic ingestion. Ann Surg 263: 808-813.
3. Goldman LP, Weigert JM (1984) Corrosive substance ingestion: A review. Am J Gastroenterol 79: 85-90.
4. Wasserman RL, Ginsburg CM (1985) Caustic substance injuries. J Pediatr 107: 169-174.
5. Keh SM, Onyekwelu N, McManus K, McGuigan J (2006) Corrosive injury to upper gastrointestinal tract: Still a major surgical dilemma. World J Gastroenterol 12: 5223-5228.
6. Triadafilopoulos G (2016) Caustic esophageal injury in adult. UpToDate.
7. Cheng HT, Cheng CL, Lin CH, Tang JH, Chu YY, et al. (2008) Caustic ingestion in adults: The role of endoscopic classification in predicting outcome. BMC Gastroenterol 8: 31.
8. Zargar SA, Kochhar R, Mehta S, Mehta SK (1992) Ingestion of strong corrosive alkalis: Spectrum of injury to upper gastrointestinal tract and natural history. Am J Gastroenterol 87: 337-341.
9. Raynaud K, Seguy D, Rogosnitzky M, Saulnier F, Pruvo FR, et al. (2016) Conservative management of severe caustic injuries during acute phase leads to superior long-term nutritional and quality of life (QoL) outcome. Langenbecks Arch Surg 401: 81-87.
10. Contini S, Scarpignato C (2013) Caustic injury of the upper gastrointestinal tract: A comprehensive review. World J Gastroenterol 19: 3918-3930.
11. Ramasamy K, Gumaste VV (2003) Corrosive ingestion in adults. J Clin Gastroenterol 37: 119-124.
12. Chang JM, Liu NJ, Pai BC, Liu YH, Tsai MH, et al. (2011) The role of age in predicting the outcome of caustic ingestion in adults: A retrospective analysis. BMC Gastroenterol 11: 72.
13. Chirica M, Bonavina L, Kelly MD, Sarfati E, Cattan P (2016) Caustic ingestion. Lancet 389: 2041-2052.
14. Struck MF, Beilicke A, Hoffmeister A, Gockel I, Gries A, et al. (2016) Acute emergency care and airway management of caustic ingestion in adults: Single center observational study. Scand J Trauma Resusc Emerg Med 24: 45.
15. Gschossmann JM, Schroeder R, Wyler F, Scheurer U, Schiemann U (2016) Whether or not to perform an early endoscopy following ingestion of potentially caustic agents: A retrospective long term analysis in a tertiary referral institution. Z Gastroenterol 54: 548-555.
16. Arevalo-Silva C, Eliashar R, Wohlgelernter J, Elidan J, Gross M (2006) Ingestion of caustic substances: A 15-year experience. Laryngoscope 116: 1422-1426.
17. Poley JW, Steyerberg EW, Kuipers ElJ, Dees J, Hartmans R, et al. (2004) Ingestion of acid and alkaline agents: Outcome and prognostic value of early upper endoscopy. Gastrointest Endosc 60: 372-377.
18. Gupta SK, Croffie JM, Fitzgerald JF (2001) Is esophagogastroduodenoscopy necessary in all caustic ingestions? J Pediatr Gastroenterol Nutr 32: 50-53.
19. Rigo GP, Camellini L, Azzolini F, Guazzetti S, Bedogni G, et al. (2002) What is the utility of selected clinical and endoscopic parameters in predicting the risk of death after caustic ingestion? Endoscopy 34: 304-310.