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INTRODUCTION

Accidental ingestion of caustic agents continues to be a major concern for pediatric emergency department clinicians. Caustic ingestions are seen most often in young children between one and three years of age and can cause severe acute injury and long-term complications, especially the development of esophageal strictures [1-5].

The evaluation and management of a child with suspected ingestion of a caustic substance are described here. Caustic esophageal injury in adults is discussed separately. (See "Caustic esophageal injury in adults".)

EPIDEMIOLOGY

The National Poison Data System compiles data annually from a population of approximately 300 million people served by the American Association of Poison Control Centers (AAPCC). In 2018, 2.1 million toxic exposures in humans were reported in the United States, of which approximately one-half occurred in children five years or younger [6]. The most commonly ingested caustic substances were household cleaning products (particularly, household bleach), which accounted for 11 percent of the toxic ingestions in young children, and cosmetics or personal care products. Caustic ingestion is most common in young children between one and three years of age [7], with boys accounting for 50 to 62 percent of cases [4,5].

Most ingestions by children are accidental, and the amounts ingested tend to be small. The opposite is the case in adolescents and adults, in whom ingestion often is deliberate and related to attempted suicide [8,9]. In such cases, the amount ingested may be large and the injury to the esophagus and stomach often severe [10]. Cases of alkali ingestion as a result of child abuse have been reported [11,12].

TYPES OF CAUSTIC SUBSTANCES

A substance is caustic if it is capable of burning or corroding organic tissue by chemical action, typically due to strong acid or alkaline properties.

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REFERENCES

1. Nuutinen M, Uhari M, Karvali T, Kouvalainen K. Consequences of caustic ingestions in children. Acta Paediatr 1994; 83:1200.

2. Byrne WJ. Foreign bodies, bezoars, and caustic ingestion. Gastrointest Endosc Clin N Am 1994; 4:99.

3. Wasserman RL, Ginsburg CM. Caustic substance injuries. J Pediatr 1985; 107:169.

4. Gaudreault P, Parent M, McGuigan MA, et al. Predictability of esophageal injury from signs and symptoms: a study of caustic ingestion in 378 children. Pediatrics 1983; 71:767.

5. Moazam F, Talbert JL, Miller D, Mollitt DL. Caustic ingestion and its sequelae in children. South Med J 1987; 80:187.

6. Gummin DD, Mowry JB, Beuhler MC, et al. 2019 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 37th Annual Report. Clin Toxicol (Phila) 2020; 58:1360.

7. Adam JS, Birck HG. Pediatric caustic ingestion. Ann Otol Rhinol Laryngol 1982; 91:656.

8. Borja AR, Ransdell HT Jr, Thomas TV, Johnson W. Lye injuries of the esophagus. Analysis of ninety cases of lye ingestion. J Thorac Cardiovasc Surg 1969; 57:533.

9. Arévalo-Silva C, Eliashar R, Wohlgelernter J, et al. Ingestion of caustic substances: a 15-year experience. Laryngoscope 2006; 116:1422.

10. Cello JP, Fogel RP, Boland CR. Liquid caustic ingestion. Spectrum of injury. Arch Intern Med 1980; 140:501.

11. Friedman EM. Caustic ingestions and foreign body aspirations: an overlooked form of child abuse. Ann Otol Rhinol Laryngol 1987; 96:709.

12. Dine MS, McGovern ME. Intentional poisoning of children--an overlooked category of child abuse: report of seven cases and review of the literature. Pediatrics 1982; 70:32.

13. Leape LL, Ashcraft KW, Scarpelli DG, Holder TM. Hazard to health--liquid lye. N Engl J Med 1971; 284:578.

14. Day RC, Bradberry SM, Sandilands EA, et al. Toxicity resulting from exposure to oven cleaners as reported to the UK National Poisons Information Service (NPIS) from 2009 to 2015. Clin Toxicol (Phila) 2017; 55:645.

15. Moore WR. Caustic ingestions. Pathophysiology, diagnosis, and treatment. Clin Pediatr (Phila) 1986; 25:192.

16. Mowry JB, Spyker DA, Brooks DE, et al. 2015 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 33rd Annual Report. Clin Toxicol (Phila) 2016; 54:924.

17. Harley EH, Collins MD. Liquid household bleach ingestion in children: a retrospective review. Laryngoscope 1997; 107:122.

18. Einhorn A, Horton L, Altieri M, et al. Serious respiratory consequences of detergent ingestions in children. Pediatrics 1989; 84:472.

19. HALLER JA, BACHMAN K. THE COMPARATIVE EFFECT OF CURRENT THERAPY ON EXPERIMENTAL CAUSTIC BURNS OF THE ESOPHAGUS. Pediatrics 1964; 34:236.

20. Friedman EM. Caustic ingestions and foreign bodies in the aerodigestive tract of children. Pediatr Clin North Am 1989; 36:1403.

21. Hawkins DB, Demeter MJ, Barnett TE. Caustic ingestion: controversies in management. A review of 214 cases. Laryngoscope 1980; 90:98.

22. Mattos GM, Lopes DD, Mamede RC, et al. Effects of time of contact and concentration of caustic agent on generation of injuries. Laryngoscope 2006; 116:456.

23. Lamireau T, Rebouissoux L, Denis D, et al. Accidental caustic ingestion in children: is endoscopy always mandatory? J Pediatr Gastroenterol Nutr 2001; 33:81.

24. Maull KI, Scher LA, Greenfield LJ. Surgical implications of acid ingestion. Surg Gynecol Obstet 1979; 148:895.

25. Dafoe CS, Ross CA. Acute corrosive oesophagitis. Thorax 1969; 24:291.

26. JOHNSON EE. A STUDY OF CORROSIVE ESOPHAGITIS. Laryngoscope 1963; 73:1651.

27. Tewfik TL, Schloss MD. Ingestion of lye and other corrosive agents--a study of 86 infant and child cases. J Otolaryngol 1980; 9:72.

28. Gupta SK, Croffie JM, Fitzgerald JF. Is esophagogastroduodenoscopy necessary in all caustic ingestions? J Pediatr Gastroenterol Nutr 2001; 32:50.

29. de Jong AL, Macdonald R, Ein S, et al. Corrosive esophagitis in children: a 30-year review. Int J Pediatr Otorhinolaryngol 2001; 57:203.

30. 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.

31. Haller JA Jr, Andrews HG, White JJ, et al. Pathophysiology and management of acute corrosive burns of the esophagus: results of treatment in 285 children. J Pediatr Surg

1971; 6:578.

32. Previtera C, Giusti F, Guglielmi M. Predictive value of visible lesions (cheeks, lips, oropharynx) in suspected caustic ingestion: may endoscopy reasonably be omitted in completely negative pediatric patients? Pediatr Emerg Care 1990; 6:176.

33. Mühlendahl KE, Oberdisse U, Krienke EG. Local injuries by accidental ingestion of corrosive substances by children. Arch Toxicol 1978; 39:299.

34. Valdez AL, Casavant MJ, Spiller HA, et al. Pediatric exposure to laundry detergent pods. Pediatrics 2014; 134:1127.

35. Davis MG, Casavant MJ, Spiller HA, et al. Pediatric Exposures to Laundry and Dishwasher Detergents in the United States: 2013-2014. Pediatrics 2016; 137.

36. Centers for Disease Control and Prevention (CDC). Health hazards associated with laundry detergent pods - United States, May-June 2012. MMWR Morb Mortal Wkly Rep 2012; 61:825.

37. Yin S, Colvin J, Behrman A. Single-Use Laundry Detergent Pack Exposures in Children Under 6 Years: A Prospective Study at U.S. Poison Control Centers. J Emerg Med 2018; 55:354.

38. Singh A, Anderson M, Altaf MA. Clinical and Endoscopy Findings in Children With Accidental Exposure to Concentrated Detergent Pods. J Pediatr Gastroenterol Nutr 2019; 68:824.

39. Day R, Bradberry SM, Thomas SHL, Vale JA. Liquid laundry detergent capsules (PODS): a review of their composition and mechanisms of toxicity, and of the circumstances, routes, features, and management of exposure. Clin Toxicol (Phila) 2019; 57:1053.

40. Swain TA, McGwin G Jr, Griffin R. Laundry pod and non-pod detergent related emergency department visits occurring in children in the USA. Inj Prev 2016; 22:396.

41. Day R, Bradberry SM, Jackson G, et al. A review of 4652 exposures to liquid laundry detergent capsules reported to the United Kingdom National Poisons Information Service 2008-2018. Clin Toxicol (Phila) 2019; 57:1146.

42. Vohra R, Huntington S, Fenik Y, et al. Exposures to Single-Use Detergent Sacs Reported to a Statewide Poison Control System, 2013-2015. Pediatr Emerg Care 2020; 36:e690.

43. American Association of Poison Control Centers. Laundry Detergent Packets. Available at: https://aapcc.org/track/laundry-detergent-packets (Accessed on February 22, 2021).

44. American Association of Poison Control Centers. AAPCC Press Release: HIGH ALERT: Intentional Exposures Among Teens to Single-Load Laundry Packets Continue to Rise (January 22, 2018). Available at: http://www.aapcc.org/press/84/ (Accessed on February 06, 2018).

45. Wason S. The emergency management of caustic ingestions. J Emerg Med 1985; 2:175.

46. Slaughter RJ, Watts M, Vale JA, et al. The clinical toxicology of sodium hypochlorite. Clin Toxicol (Phila) 2019; 57:303.

47. Stenson K, Gruber B. Ingestion of caustic cosmetic products. Otolaryngol Head Neck Surg 1993; 109:821.

48. Ahsan S, Haupert M. Absence of esophageal injury in pediatric patients after hair relaxer ingestion. Arch Otolaryngol Head Neck Surg 1999; 125:953.

49. Aronow SP, Aronow HD, Blanchard T, et al. Hair relaxers: a benign caustic ingestion? J Pediatr Gastroenterol Nutr 2003; 36:120.

50. Waasdorp Hurtado CE, Kramer RE. Salicylic acid ingestion leading to esophageal stricture. Pediatr Emerg Care 2010; 26:146.

51. Sacchetti A, Ramoska E. Ingestion of Compound W, an unusual caustic. Am J Emerg Med 1986; 4:554.

52. Zargar SA, Kochhar R, Nagi B, et al. Ingestion of corrosive acids. Spectrum of injury to upper gastrointestinal tract and natural history. Gastroenterology 1989; 97:702.

53. Edmonson MB. Caustic alkali ingestions by farm children. Pediatrics 1987; 79:413.

54. Kirsh MM, Ritter F. Caustic ingestion and subsequent damage to the oropharyngeal and digestive passages. Ann Thorac Surg 1976; 21:74.

55. Wheeler DS, Bonny AE, Ruddy RM, Jacobs BR. Late-onset respiratory distress after inhalation of laundry detergent. Pediatr Pulmonol 2003; 35:323.

56. Ozcan C, Ergün O, Sen T, Mutaf O. Gastric outlet obstruction secondary to acid ingestion in children. J Pediatr Surg 2004; 39:1651.

57. Ozokutan BH, Ceylan H, Ertaşkin I, Yapici S. Pediatric gastric outlet obstruction following corrosive ingestion. Pediatr Surg Int 2010; 26:615.

58. Cadranel S, Di Lorenzo C, Rodesch P, et al. Caustic ingestion and esophageal function. J Pediatr Gastroenterol Nutr 1990; 10:164.

59. Cucchiara S, Staiano A, Di Lorenzo C, et al. Esophageal motor abnormalities in children with gastroesophageal reflux and peptic esophagitis. J Pediatr 1986; 108:907.

60. Hillemeier AC, Grill BB, McCallum R, Gryboski J. Esophageal and gastric motor abnormalities in gastroesophageal reflux during infancy. Gastroenterology 1983; 84:741.

61. Moulin D, Bertrand JM, Buts JP, et al. Upper airway lesions in children after accidental ingestion of caustic substances. J Pediatr 1985; 106:408.

62. Sherenian MG, Clee M, Schondelmeyer AC, et al. Caustic ingestions mimicking anaphylaxis: case studies and literature review. Pediatrics 2015; 135:e547.

63. Ferguson MK, Migliore M, Staszak VM, Little AG. Early evaluation and therapy for caustic esophageal injury. Am J Surg 1989; 157:116.

64. Fisher J, Mittal R, Hill S, et al. Yield of chest radiography after removal of esophageal foreign bodies. Pediatrics 2013; 131:e1497.

65. Brumbaugh DE, Colson SB, Sandoval JA, et al. Management of button battery-induced hemorrhage in children. J Pediatr Gastroenterol Nutr 2011; 52:585.

66. Maull KI, Osmand AP, Maull CD. Liquid caustic ingestions: an in vitro study of the effects of buffer, neutralization, and dilution. Ann Emerg Med 1985; 14:1160.

67. Wilsey MJ Jr, Scheimann AO, Gilger MA. The role of upper gastrointestinal endoscopy in the diagnosis and treatment of caustic ingestion, esophageal strictures, and achalasia in children. Gastrointest Endosc Clin N Am 2001; 11:767.

68. Betalli P, Falchetti D, Giuliani S, et al. Caustic ingestion in children: is endoscopy always indicated? The results of an Italian multicenter observational study. Gastrointest Endosc 2008; 68:434.

69. Di Nardo G, Betalli P, Illiceto MT, et al. Caustic Ingestion in Children: 1 Year Experience in 3 Italian Referral Centers. J Pediatr Gastroenterol Nutr 2020; 71:19.

70. Crain EF, Gershel JC, Mezey AP. Caustic ingestions. Symptoms as predictors of esophageal injury. Am J Dis Child 1984; 138:863.

71. Hoffman RS, Burns MM, Gosselin S. Ingestion of Caustic Substances. N Engl J Med 2020; 382:1739.

72. 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.

73. Betalli P, Rossi A, Bini M, et al. Update on management of caustic and foreign body ingestion in children. Diagn Ther Endosc 2009; 2009:969868.

74. Hawkins DB. Dilation of esophageal strictures: comparative morbidity of antegrade and retrograde methods. Ann Otol Rhinol Laryngol 1988; 97:460.

75. Usta M, Erkan T, Cokugras FC, et al. High doses of methylprednisolone in the management of caustic esophageal burns. Pediatrics 2014; 133:E1518.

76. Thomson M, Tringali A, Dumonceau JM, et al. Paediatric Gastrointestinal Endoscopy: European Society for Paediatric Gastroenterology Hepatology and Nutrition and European Society of Gastrointestinal Endoscopy Guidelines. J Pediatr Gastroenterol Nutr 2017; 64:133.

77. Katibe R, Abdelgadir I, McGrogan P, Akobeng AK. Corticosteroids for Preventing Caustic Esophageal Strictures: Systematic Review and Meta-analysis. J Pediatr Gastroenterol Nutr 2018; 66:898.

78. Tuncer R, Soyupak S, Sen N. . Does steroid treatment prevent caustic esophageal stricture? A prospective study. Ann Med Sci 2000; 9:56.

79. Homan M, Orel R, Liacouras C. Caustic ingestion: a possible cause of eosinophilic esophagitis? Pediatrics 2013; 131:e1284.

80. Riffat F, Cheng A. Pediatric caustic ingestion: 50 consecutive cases and a review of the literature. Dis Esophagus 2009; 22:89.

81. Webb WR, Koutras P, Ecker RR, Sugg WL. An evaluation of steroids and antibiotics in caustic burns of the esophagus. Ann Thorac Surg 1970; 9:95.

82. Gumaste VV, Dave PB. Ingestion of corrosive substances by adults. Am J Gastroenterol 1992; 87:1.

83. 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.

84. Karnak I, Tanyel FC, Büyükpamukçu N, Hiçsönmez A. Combined use of steroid, antibiotics and early bougienage against stricture formation following caustic esophageal burns. J Cardiovasc Surg (Torino) 1999; 40:307.

85. Uygun I, Arslan MS, Aydogdu B, et al. Fluoroscopic balloon dilatation for caustic esophageal stricture in children: an 8-year experience. J Pediatr Surg 2013; 48:2230.

86. Tiryaki T, Livanelioğlu Z, Atayurt H. Early bougienage for relief of stricture formation following caustic esophageal burns. Pediatr Surg Int 2005; 21:78.

87. Sato Y, Frey EE, Smith WL, et al. Balloon dilatation of esophageal stenosis in children. AJR Am J Roentgenol 1988; 150:639.

88. Ball WS, Strife JL, Rosenkrantz J, et al. Esophageal strictures in children. Treatment by balloon dilatation. Radiology 1984; 150:263.

89. Song HY, Han YM, Kim HN, et al. Corrosive esophageal stricture: safety and effectiveness of balloon dilation. Radiology 1992; 184:373.

90. Lan LC, Wong KK, Lin SC, et al. Endoscopic balloon dilatation of esophageal strictures in infants and children: 17 years' experience and a literature review. J Pediatr Surg 2003; 38:1712.

91. Alshammari J, Quesnel S, Pierrot S, Couloigner V. Endoscopic balloon dilatation of esophageal strictures in children. Int J Pediatr Otorhinolaryngol 2011; 75:1376.

92. Jayakrishnan VK, Wilkinson AG. Treatment of oesophageal strictures in children: a comparison of fluoroscopically guided balloon dilatation with surgical bouginage. Pediatr Radiol 2001; 31:98.

93. Kahriman G, Hosgecin C, Herdem N, et al. Fluoroscopy-guided balloon dilatation of benign esophageal strictures in children: 11-year experience. Pediatr Radiol 2022; 52:977.

94. Uhlen S, Fayoux P, Vachin F, et al. Mitomycin C: an alternative conservative treatment for refractory esophageal stricture in children? Endoscopy 2006; 38:404.

95. Olutoye OO, Shulman RJ, Cotton RT. Mitomycin C in the management of pediatric caustic esophageal strictures: a case report. J Pediatr Surg 2006; 41:e1.

96. Rosseneu S, Afzal N, Yerushalmi B, et al. Topical application of mitomycin-C in oesophageal strictures. J Pediatr Gastroenterol Nutr 2007; 44:336.

97. El-Asmar KM, Hassan MA, Abdelkader HM, Hamza AF. Topical mitomycin C application is effective in management of localized caustic esophageal stricture: a double-blinded, randomized, placebo-controlled trial. J Pediatr Surg 2013; 48:1621.

98. 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.

99. El-Asmar KM. Topical Mitomycin C application for esophageal stricture: safe, precise, and novel endoscopic technique. J Pediatr Surg 2013; 48:1454.

100. Wishahy AMK, Seleim H, Qinawy M, et al. Short-term Effects of Mitomycin C Infiltration for Caustic Oesophageal Strictures in Children. J Pediatr Gastroenterol Nutr 2019; 69:673.

101. 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.

102. Ley D, Bridenne M, Gottrand F, et al. Efficacy and Safety of the Local Application of Mitomycin C to Recurrent Esophageal Strictures in Children. J Pediatr Gastroenterol Nutr 2019; 69:528.

103. Atabek C, Surer I, Demirbag S, et al. Increasing tendency in caustic esophageal burns and long-term polytetrafluorethylene stenting in severe cases: 10 years experience. J Pediatr Surg 2007; 42:636.

104. Vandenplas Y, Hauser B, Devreker T, et al. A biodegradable esophageal stent in the treatment of a corrosive esophageal stenosis in a child. J Pediatr Gastroenterol Nutr 2009; 49:254.

105. Best C, Sudel B, Foker JE, et al. Esophageal stenting in children: indications, application, effectiveness, and complications. Gastrointest Endosc 2009; 70:1248.

106. Karakan T, Utku OG, Dorukoz O, et al. Biodegradable stents for caustic esophageal strictures: a new therapeutic approach. Dis Esophagus 2013; 26:319.

107. West KW, Vane DW, Grosfeld JL. Esophageal replacement in children: experience with thirty-one cases. Surgery 1986; 100:751.

108. Han MT. Ileocolic replacement of esophagus in children with esophageal stricture. J Pediatr Surg 1991; 26:755.

109. Appelqvist P, Salmo M. Lye corrosion carcinoma of the esophagus: a review of 63 cases. Cancer 1980; 45:2655.

110. Ansari MM, Haleem S, Harris SH, et al. Isolated corrosive pyloric stenosis without oesophageal involvement: an experience of 21 years. Arab J Gastroenterol 2011; 12:94.

111. Tekant G, Eroğlu E, Erdoğan E, et al. Corrosive injury-induced gastric outlet obstruction: a changing spectrum of agents and treatment. J Pediatr Surg 2001; 36:1004.

112. Treem WR, Long WR, Friedman D, Watkins JB. Successful management of an acquired gastric outlet obstruction with endoscopy guided balloon dilatation. J Pediatr Gastroenterol Nutr 1987; 6:992.

113. Temiz A, Oguzkurt P, Ezer SS, et al. Management of pyloric stricture in children: endoscopic balloon dilatation and surgery. Surg Endosc 2012; 26:1903.