In Response to \textit{pH-Neutralizing Esophageal Irrigations as a Novel Mitigation Strategy}

In Reply:

We would like to thank Dr. Costello and colleagues for their comments related to our recent publication.\footnote{Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. \textit{pH-Neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury} [published online June 11, 2018]. \textit{Laryngoscope} doi: 10.1002/lary.27312.}

In June 2018, the National Capital Poison Center Battery guidelines were updated, and the pre-hospital use of honey, as well as the in-hospital use of either honey or sucralfate (Carafate\textsuperscript{®}), are to be considered in a child who can swallow.\footnote{1. Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. \textit{pH-Neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury} [published online June 11, 2018]. \textit{Laryngoscope} doi: 10.1002/lary.27312.} These interventions are recommended for button battery (BB) ingestions within 12 hours, where the risk of an existing perforation is low.\footnote{1. Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. \textit{pH-Neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury} [published online June 11, 2018]. \textit{Laryngoscope} doi: 10.1002/lary.27312.} In the setting of partial esophageal obstruction from a BB where liquids can flow around it, we point out that the risk of pulmonary aspiration is low when a child can swallow such liquids. In our studies, it was determined that honey and sucralfate (Carafate\textsuperscript{®}) were equally effective relative to control, and there was no significant difference between them.\footnote{1. Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. \textit{pH-Neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury} [published online June 11, 2018]. \textit{Laryngoscope} doi: 10.1002/lary.27312.} For example, in the emergency department at Nationwide Children’s Hospital, both options are stocked and immediately available for use. The use of honey in children <1 year of age is discouraged due to botulinum risk, and sucralfate (Carafate\textsuperscript{®}) is an alternative. Although both are palatable options in children who can swallow, some may prefer a cherry-flavored option like sucralfate (Carafate\textsuperscript{®}) over honey. We would agree that honey is lower cost and should be made available in the urgent care and emergency room settings.

Shepherd and colleagues conducted an animal study in a rat model, histologically investigating acute lung injury between a control, sucralfate, or pH-adjusted normal saline. A statistically significant increase in lung hemorrhage was noted with sucralfate compared to control. It was found that pH-adjusted normal saline had the greatest amount of inflammation, more than sucralfate.\footnote{1. Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. \textit{pH-Neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury} [published online June 11, 2018]. \textit{Laryngoscope} doi: 10.1002/lary.27312.} To our knowledge, there are no published studies relating to any long-term sequelae of human aspiration of sucralfate (Carafate\textsuperscript{®}). For esophageal BB, the incremental dosing of either honey or sucralfate (Carafate\textsuperscript{®})—10 mL (two teaspoons) every 10 minutes—allows for assessment of aspiration risk with each sip. Therefore, a large volume of aspiration with either substance is minimized. It is important to note that sucralfate has been widely used in children as stress-ulcer prophylaxis during periods of intubation,\footnote{1. Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. \textit{pH-Neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury} [published online June 11, 2018]. \textit{Laryngoscope} doi: 10.1002/lary.27312.} and once it reaches the low pH of the stomach it gets activated into a gel form that adheres to the gastric mucosa. During the in vivo animal studies, for either agent, the BB could be easily endoscopically visualized and removed; the suggested “white residue” was not an issue.

Given equal effectiveness during in vitro and in vivo animal studies, we feel it is too soon to designate a first-line recommendation of honey alone. Managing clinicians should assess each scenario and decide on which option is best when a child can swallow liquids, knowing both can help slow the rate of BB injury. It is important that we continue to track the human clinical experience and outcomes with use of honey and/or sucralfate (Carafate\textsuperscript{®}).

For additional information on the latest National Capital Poison Center Button Battery Triage and Treatment Guidelines, go to https://www.poison.org/battery/guideline.

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\textbf{BIBLIOGRAPHY}


