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ORIGINAL ARTICLE

Cola therapy for oesophageal food bolus impactions a case series

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ABSTRACT

Introduction: This retrospective case series describes the use of cola to immediately treat complete oesophageal food bolus obstructions in the emergency centre. Short of emergent endoscopy – which is invasive, expensive, not without adverse events, and often unavailable in low-resource settings – no other proven therapies exist to relieve oesophageal food impactions.

Methods: We performed a chart review of adults with complete oesophageal food bolus obstructions presenting to two Dutch emergency centres. Our primary outcome was cola's success rate in resolving the obstruction. Our secondary outcome was adverse event occurrence.

Results: We identified 22 cola interventions in 19 patients, the majority of whom (77.3%) were male. The median age was 59 years (IQR 29–73). All presentations were due to meat impaction. Endoscopy revealed relevant upper gastrointestinal pathology in 54.5%. When initiated in the emergency centre, cola successfully resolved 59% of complete oesophageal obstructions. No adverse events were reported in patients successfully treated with cola.

Discussion: While keenly aware of our retrospective study's limitations, we found a promising success rate for cola as an acute intervention for oesophageal food bolus impactions. We registered no adverse events attributable to cola. Also, given that cola is cheap, widely available and seemingly safe we believe it can be considered in patients with oesophageal obstructions due to food, either as pre-endoscopy treatment or in case endoscopy is not available at all. We think our findings provide an impetus for prospective research on this intervention.

African relevance

- Removal of oesophageal food bolus obstructions is vital to prevent complications.
- Emergent endoscopic removal is unavailable in many African settings.
- Potential benefits of non-endoscopic removal include rapid symptom relief and improved health care utilisation.

Introduction

Patients who present with oesophageal food bolus impactions are often acutely uncomfortable, drooling and gagging, and at risk for a variety of complications including oesophageal perforation and aspiration. The guideline of the American and European Societies for Gastrointestinal Endoscopy recommend emergent endoscopy for complete oesophageal food bolus obstructions [1,2]. The guideline also allows for pre-endoscopy medical management, so long as it does not delay endoscopy [1,2]. Given the lack of readily-available endoscopy services in many developing regions [3], pre-endoscopy management options may offer a viable alternative for adequate care. If available, follow-up elective diagnostic endoscopy would still be required per current guidelines [1,2].

A variety of non-endoscopic medications and interventions are described in the current medical literature; however, all of these alternatives are associated with limited or conflicting studies on their use [4,5]. Examples include: butyl scopolamine [6,7], glucagon [8,9], benzodiazepines [10], calcium channel blockers [11], nitrates [12,13],

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meat tenderizers (which has been firmly discredited and the only treatment known to cause harm) [14], and effervescent drinks (e.g. cola) [15].

Cola has been promulgated as a treatment option for more than 20 years [16]. Those who search online for remedies for *stuck food* will find that the internet is replete with advice for cola use. Cola has also been advocated as a safe treatment for patients in whom endoscopic removal of a food bolus is judged to be too risky [17,18]. Despite its popularity, there is minimal evidence surrounding cola's use in removing food boluses. The largest two series to date describe the use of cola in only five patients each [16,17].

We were led to study cola as a pre-endoscopy food bolus impaction management strategy after some individual case successes with cola in our emergency centre (EC). These successes led to an increase in cola use, and a resultant need for more safety and efficacy data. We conducted a retrospective case series to evaluate if the use of cola warrants further prospective research.

We hypothesised that cola can resolve a substantial percentage of complete oesophageal obstructions. Cola intervention success rate was the primary outcome of this study, defined as resolution as manifested by symptom abatement and the ability to swallow normally. Our secondary outcome was any cola-related adverse events.

Methods

This is a retrospective analysis of cases of complete oesophageal food bolus obstructions that presented to the ECs of two large Dutch teaching community hospitals with an annual census between 20,000 and 30,000 patients. The study was approved by the Boards of Directors and the ethical committees of both hospitals. The STROBE guidelines for observational studies were used to design this study.

We abstracted data for patients aged 18 or older that presented acutely with a history of complete oesophageal food bolus impaction between 01 January 2014 to 01 July 2016. Only health records that documented the sensation of food stuck between the oropharynx and the epigastrium while attempting to swallow and the inability to swallow saliva or fluids were included for analysis. Patients who could still pass fluids were excluded, since they could have been experiencing a globus sensation instead of an obstruction. Those who had attempted to swallow non-food items, as well as those who came to the EC after a pre-hospital cola attempt were also excluded.

All pre-endoscopic treatments were recorded, including use of cola. There was no specific cola treatment protocol in place at the time. The amount, number of attempts, as well as a number of other parameters related to the treatment were not clearly described in the health records and thus omitted from the study. It is likely that use may have differed between physicians as would patients' ability to follow instructions. That said, cola was likely used as follows: The procedure, possible risks, and alternatives would be explained. Upon consenting, the patient would be given a bowl or placed by the sink due to possible regurgitation of cola and/ or drooling. The patient would then be asked to attempt to swallow a couple of cola sips. If the impaction didn't resolve, the same procedure was repeated after a few minutes. If still unsuccessful after a few attempts, urgent endoscopy would be arranged.

Due to diagnostic coding inconsistencies in one of the hospitals, a reliable automated search in the electronic health records for patients with gastrointestinal (GI) tract foreign bodies could not be conducted. Instead, the search term "cola" was used. For Hospital 1 we identified relevant cases using the diagnostic code "foreign bodies in GI tract." For Hospital 2, due to the diagnostic coding inconsistencies described, we manually reviewed all "cola" charts to identify relevant cases.

Three abstractors (two emergency medicine residents and one emergency physician) extracted previously defined variables such as patient characteristics, cola treatment success, other attempted treatments and adverse events, using a standardised pilot-tested data collection form and coding rules. We considered the intervention to be successful if the electronic health record documented symptom resolution and the ability to swallow normally in the EC after taking cola. Endoscopic confirmation of food bolus passage was not required to prove intervention success. We defined adverse events as: oesophageal perforation, mucosal laceration, bleeding, aspiration, or any other complication requiring treatment and leading to a prolonged EC stay or full hospitalisation. We screened the electronic health records of our patient group for any reports of complications related to EC visits for oesophageal food impactions, both at primary presentation and on subsequent visits, if any.

To resolve inter-rater disagreements, two abstractors independently analysed all charts for the following key variables: inability to swallow, cola success, and GI-related comorbidities. Any differences in interpretation were discussed and resolved.

SPSS Version 22 (© IBM Corp; Armonk, New York, USA) was used for descriptive analysis. Quantitative variables were recorded as median ± interquartile range.

Results

During the study period, cola was used 52 times in study site ECs. Sixteen records were excluded from analysis because of pre-hospital cola use. Seven were excluded because it was not clear that the patient had a complete obstruction. Five were excluded because the patient was aged less than 18 and two because the patient had attempted to swallow non-food items. Regarding inter-rater agreement, our abstractors disagreed on the ability of two patients to swallow successfully. These two cases were labelled separately but eventually included in our analyses of complete oesophageal obstruction cases, because complete obstruction seemed very plausible. There were no disagreements on cola's success. Our final sample included 22 attempts of cola disimpaction in 19 patients (one patient presented on two separate occasions and another presented on three separate occasions) for review of their health records.

The majority of study subjects were male (77.3%, 17 of 22) (Table 1). The median age was 59 (IQR 29–73) with a range of 19–83 years (n = 22). All presentations resulted from meat impaction: chicken or turkey being most common (27.3%, 6 of 22). Impaction duration was inconsistently recorded. In records containing this information, median impaction time at EC arrival was 2 h (range 0.75–48 h) (n = 11). Most presentations (59.1%, 13 of 22) occurred out-of-office-hours, between 5 pm and 8am.

A previous episode of difficulty passing food was reported in 50% (11 of 22). Previous or subsequent endoscopy revealed relevant upper gastrointestinal findings in 54.5%: benign in 50% (11 of 22) and malignant in 4.5% (1 of 22). In 13.6% (3 of 22), endoscopic results were

Table 1
Characteristics of patients presenting with oesophageal food bolus impaction (N = 22).

Gender (n, %)		
Male	17	77.3
Female	5	22.7
Age		
Median (min–max)	59	19–83
Impacted food		
Chicken/Turkey	6	27.3
Beef	5	22.7
Pork	4	18.2
Other meat	7	31.8
Underlying pathology		
Stricture	7	31.8
Oesophagitis	8	36.4
Diaphragmatic hernia	7	31.8
No pathology	3	13.6
No endoscopy performed	7	31.8

normal. In the remainder of cases (31.8%, 7 of 22), there was no relevant past medical history or pathology known and endoscopy was never performed.

In 59.1% (13 of 22), food bolus obstructions resolved in the EC after cola. In the remaining 40.9%, food boluses were removed endoscopically. After successful cola treatment, the impacted food passed distally in 46.1% (6 of 13). Food bolus regurgitation occurred in 30.7% (4 of 13). Passage details were not recorded in three cases.

There were no short-term adverse events recorded for patients who'd been successfully treated with cola. During one of the endoscopic removals (4.5%), a small mucosal laceration was noted at the site of meat impaction. This patient was discharged after endoscopy.

Our record review indicated that none of the patients who had been successfully treated with cola received any other treatment. In 7 of 9 (77.8%) patients in whom cola failed, other pre-endoscopy measures such as nitroglycerine, nifedipine and glucagon were attempted. All were unsuccessful.

Discussion

We found that cola resolved 59% of complete oesophageal food bolus obstructions, with success in varying age groups as well as those with and without relevant medical history. No adverse events were recorded in the EC after cola administration. The mucosal tear that was recorded during emergent endoscopic removal was within the expected range of adverse events following removal of an oesophageal food bolus, but we cannot exclude that cola contributed to this self-limited complication.

The use of cola to relieve oesophageal food bolus impaction was first described in the 1990s. A small case series detailed six attempts using cola in five patients and reported a 100% resolution rate within 24 h [16]. Another, more recent case series, described cocktails of pancrelipase (Creon 10,000 IU) in 30 mL of Coca-Cola in five patients and reported either resolution, or easier successful post-intervention endoscopy [17]. No complications occurred in either study. Our case series is the largest on this topic thus far and its results support our original hypothesis: that cola - an inexpensive, globally available agent without documented side effects when taken in small quantities – can quickly and safely resolve a substantial percentage of complete oesophageal obstructions.

It is unclear how cola works to relieve oesophageal food bolus obstructions. Previous authors have considered whether carbonated drinks might disintegrate the food bolus [16,17]. However, an *in vitro* study, showed that Coca-Cola® did not cause any significant movement of pieces of cooked chicken that were squeezed tightly in graduated syringes [19]. The mechanism of action may possibly be that cola relaxes the oesophagus, thereby facilitating food passage. A 2012 study using 200 mL of Pepsi® found a dramatic decrease in lower oesophageal sphincter pressure, but this study is limited by including only healthy volunteers without food impactions [20].

We are well aware that the retrospective nature of our study, through chart review of previously-defined datapoints, comes with several significant limitations. We cannot exclude an interpretation bias as a result. Our coding rules for data collection were designed to leave little room for interpretation, but the abstractors were not blinded to the study's objective and hypothesis. Additionally, certain data points were missing. The impaction duration (based on the patient's history) was not reliably recorded. There was very little information on how quickly obstructions resolved or how many cola sips were taken prior to resolution. As the cola dose and administration were not standardised, this may have led to inadequate use and lack of success in some cases. In addition, successful cola treatment was not followed by diagnostic endoscopy in about a third of cases. Underlying pathology therefore remained unknown in these cases. Selection bias might also have been present, as cola was used at the discretion of the treating physician and therefore not offered to all patients with oesophageal food bolus impactions.

We cannot comment on adverse events that occurred in patients that were sucessfully treated with cola and subsequently discharged from the EC. As unlikely as it may be that adverse events did occur in our relatively closed healthcare system, it is possible that some may have suffered oesophageal damage and did not return to the same hospital where they were given cola. Finally, this study was not controlled, and it is unknown if the food bolus impactions may have resolved spontaneously without cola intervention.

We would like to be clear that cola treatment does not currently represent the standard of care. It may be prudent to ensure that you are working with an alert, calm, cooperative patient who can gag or spit if necessary. Access to suction can also be a helpful adjunct. While we do not believe that our findings warrant a change in current guidelines, we do feel that those guidelines are not easy to apply in low-resource settings. In the absence of endoscopic intervention, the availability of a non-invasive treatment option, such as cola, can be vital. Cola is a cheap, potentially effective, over-the-counter agent that is readily available worldwide. Short of emergent endoscopy, which is invasive, expensive, resource intensive, and not without its own adverse events, no other proven therapies exist to relieve oesophageal food bolus impactions. Based on the outcomes of this study, future investigation, including a randomised controlled trial, should be strongly considered.

Conflict of interest

The authors declared no conflicts of interest.

Dissemination of results

Results from this study were presented at the 2016 Netherlands Society for Emergency Medicine Conference and the 2017 EMSSA Conference. Results were also presented to the staff members of the Westfriesgasthuis Hospital emergency centre at one of the designated research meetings.

Authors' contributions

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: EB contributed 40%, TB and MB contributed 15% each, AC, NM and AB contributed 10% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

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