

# Bedside ultrasound assessment of gastric content in children noncompliant with preoperative fasting guidelines: Is it time to include this in our practice?

### ABSTRACT

Ultrasound assessment of gastric contents and volume is gaining popularity in adults and children. At present, a preoperative verbal check is used to determine the fasting status. Due to fear of delay or cancellation of surgery, parents may not disclose noncompliance with fasting guidelines. Pulmonary aspiration of gastric contents is a potential cause of morbidity and mortality. Ultrasound assessment of gastric contents is noninvasive and easy to learn. We present a series of three cases to demonstrate how the use of ultrasound to assess gastric contents in children can provide an objective means for decision-making and impact anesthetic management when preoperative fasting status is uncertain.

**Key words:** Children; gastric contents; preoperative fasting; ultrasound assessment

### Introduction

There has been increasing interest in the use of ultrasound in various clinical scenarios including the qualitative and quantitative assessment of gastric contents in patients of all ages.<sup>[1-3]</sup> Compliance with preoperative fasting guidelines is a prerequisite for elective surgical procedures to decrease the incidence of pulmonary aspiration. It has been reported that 7% of children presenting for ambulatory surgery were inadequately fasted preoperatively.<sup>[4]</sup> This leads to either delays or cancellations of elective surgeries causing parental dissatisfaction and the inefficient use of health resources. We present a case series of three cases to demonstrate the use of ultrasound assessment of stomach contents in infants and children, noncompliant with preoperative fasting guidelines,

and to provide an objective means in the decision-making process.

### Case Reports

#### Patient #1

A 6-month-old, 6.4 kg, male child without comorbid issues, presented for chordee repair. He was fed apple juice <2 h before the surgical time. Surgery was delayed to maintain compliance with institutional fasting guidelines. Ultrasound assessment of gastric contents was not attempted before induction as the child would not cooperate. After an uneventful inhalation induction and endotracheal intubation, a Terason (Burlington, MA) ultrasound linear

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### UMA R. PAREKH, NIRAJA RAJAN, ROBYN C. IGLEHART, PATRICK M. MCQUILLAN

Department of Anesthesiology and Perioperative Medicine, Penn State Milton S Hershey Medical Center, Penn State Milton S Hershey Children's Hospital, Hershey, PA 17033, USA

**Address for correspondence:** Dr. Uma Parekh, Department of Anesthesiology and Perioperative Medicine, Penn State Milton S Hershey Medical Center, Penn State Milton S Hershey Children's Hospital, 500 University Drive, Hershey, PA 17033, USA.  
E-mail: uparekh@pennstatehealth.psu.edu

array high-frequency transducer probe (4–15 MHz) was used to scan the gastric antrum, in the epigastric sagittal plane in right lateral position, to confirm an empty stomach [Figure 1d]. The antrum, distended with clear fluid, was seen as an elliptical hypoechoic area between the liver anteriorly and the pancreas posteriorly [Figure 1a]. Stomach contents were immediately suctioned, and about 16 ml (approximately 2.5 mL/kg) of clear fluid was obtained. The gastric antrum was rescanned and confirmed to be almost completely empty. The trachea was extubated uneventfully at the end of the surgery, and the child was discharged home from the postanesthesia care unit (PACU) after meeting discharge criteria.

### Patient #2

An otherwise healthy 3-year-old, 12.5 kg, male child was scheduled for repair of a right inguinal hernia. When the fasting status was queried, the mother stated the child had eaten potato chips approximately 6 h before the surgical time. Given the borderline fasting status, the gastric antrum was scanned using a Terason linear array high-frequency probe in the epigastric sagittal plane with the patient in right lateral position. This revealed an antrum filled with solid contents [Figure 1b]. Surgery was rescheduled for another day.

### Patient #3

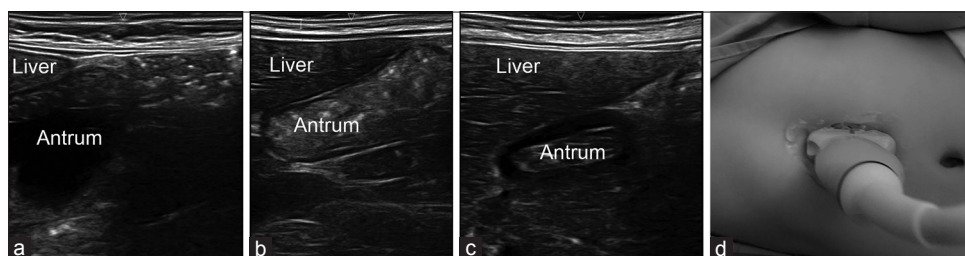
A 3-year old, 15 kg, girl was scheduled for repair of umbilical and epigastric hernias. She had no other significant medical problems. Preoperative evaluation revealed that the child was given clear fruit punch about 90 min before the surgical time. Bedside ultrasound of the gastric antrum, performed in the left lateral position with a Terason ultrasound using a linear array high frequency in the epigastric sagittal plane, revealed an empty antrum [Figure 1c]. Surgery was not delayed in compliance with 2 h of NPO rule before surgery. After inhalational induction, airway was maintained with size 2 laryngeal mask airway (LMA). Intraoperative and postoperative course was uneventful. She was discharged home from the PACU after meeting discharge criteria.

## Discussion

We describe three children in whom the point of care gastric ultrasound was used to assess gastric contents in situations where duration and adequacy of preoperative fasting were uncertain. In the first case, ultrasonography after induction of anesthesia led us to empty the stomach to decrease the risk of aspiration of gastric contents and its sequelae. Had we performed the ultrasonography preoperatively, the anesthetic management would have been altered by either delaying the case further or by performing a rapid sequence induction. In the second case, based on the sonographic findings of solid contents in the antrum, surgery was rescheduled on another day. In the third case, ultrasound of the gastric antrum provided objective evidence showing an empty gastric antrum, and thus we could proceed with surgery without delay, and the airway was safely managed with an LMA.

The gastric antrum can be consistently scanned in the epigastric sagittal plane inferior to the left lobe of the liver and anterior to pancreas at the level of the aorta or inferior vena cava in the right lateral decubitus (RLD) position.<sup>[5,6]</sup> In the empty stomach, the antrum appears flat and collapsed [Figure 1c]. In the sagittal scanning plane, the image has a “bull’s eye” appearance, and in the axial plane, a “gloved finger” appearance. When filled with clear fluid, the antrum appears round, distended, and hypoechoic [Figure 1a]. When the antrum is filled with milk, thick fluids, and solids, it is hyperechoic and distended and shows a heterogeneous appearance [Figure 1b]. The correlation between the gastric antrum volume and the gastric volume is better in the RLD than the supine position.<sup>[6,7]</sup> When the stomach is filled with clear fluids, the volume can be measured from the antral cross-sectional area. A three-point grading from 0 to 2 with increasing grade suggesting increased gastric volume has been proposed.<sup>[3,7]</sup>

Preoperative fasting guidelines are aimed at ensuring an empty stomach to reduce the risk of pulmonary aspiration of gastric contents and its consequences. When fasting guidelines have been followed, we presume that children



**Figure 1:** Transducer position to scan the gastric antrum in the right lateral position (d), sonographic images of the antrum filled with clear fluid (a), with solid contents (b), and empty (c)

have an almost empty stomach. Fasting guidelines are based on current literature and consensus opinions. They clearly state that they are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome.<sup>[8]</sup> Therefore, based on the clinical scenario, there may be a need to objectively confirm the adequacy of preoperative fasting. Besides an undetermined prandial status, there are other risk factors for pulmonary aspiration that increase gastric volumes including emergency surgery, esophageal and gastrointestinal pathology, trauma, raised intracranial pressure, and depressed level of consciousness. Real-time gastric ultrasonography is easy to learn and perform, noninvasive, reproducible, and does not expose the patient to ionizing radiation.<sup>[9,10]</sup> Supplementing NPO guidelines with a sonographic assessment of gastric contents in children may improve decision-making when the preoperative fasting status is difficult to determine and has the potential to reduce adverse respiratory events from pulmonary aspiration and may limit the need to delay or cancel surgical procedures.

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#### Conflicts of interest

There are no conflicts of interest.

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