Trust But Verify: A Lesson in Communication and The Utility of Gastric Ultrasound

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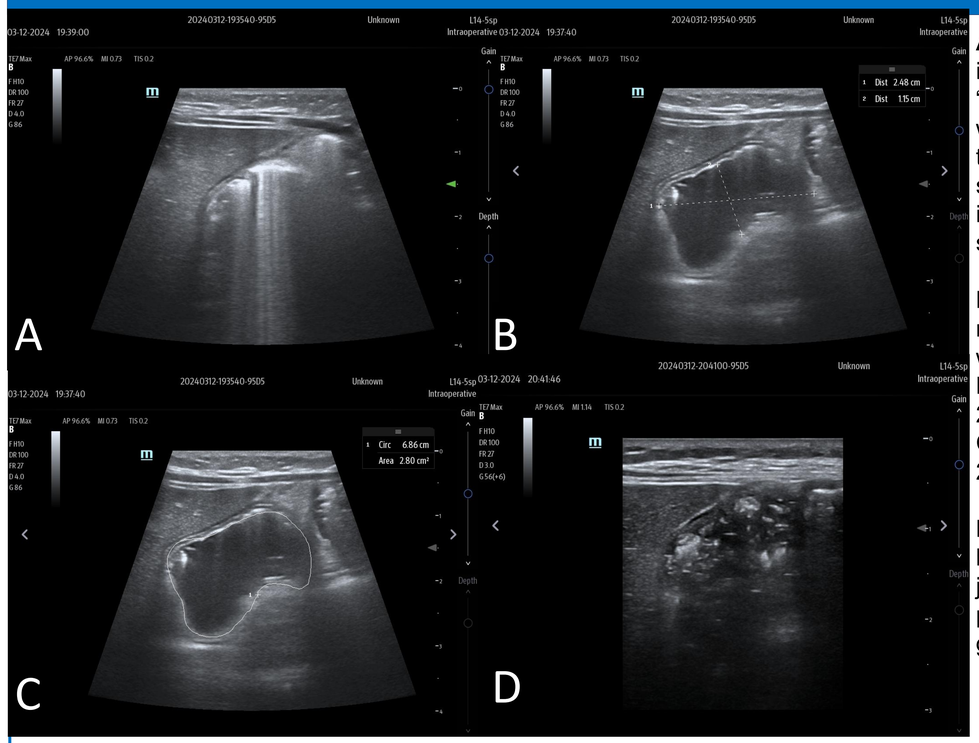
INTRODUCTION

Aspiration of gastric contents during general anesthesia is a serious and potentially fatal complication for the pediatric patient, with an estimated incidence rate between 0.04-0.1% (5). The risk of aspiration in the pediatric patient is complicated by the difficulty of accurately ensuring NPO status due to multiple factors including the patient not being able to communicate themselves, reliance on caregiver to provide accurate information, and noncompliance from both the patient or the caregivers. This risk is further complicated in patients with a language barrier, which can lead to miscommunication of preoperative instructions and ultimately lead to a delay of receiving care (2). Gastric ultrasound offers direct and noninvasive visualization of gastric contents in real-time, helping to confirm NPO status and mitigate aspiration risk while eliminating the possibility of miscommunication.

CASE PRESENTATION

A 5-month-old male born at 35w3d due to maternal preeclampsia with severe features with uncomplicated NICU stay and no additional PMH presented for excision of right foot polydactyly. During the initial preoperative interview NPO status was verified with the patient's caregiver, however a subsequent interview using an interpreter revealed consumption of 1 ounce of juice thirty minutes prior at 0730. Gastric ultrasound was performed at 0830, initially in supine position, showing a "frosted glass" appearance. The patient was then placed in the right lateral decubitus (RLD) position and rescanned. This scan clearly showed a full stomach. Calculations of the gastric area revealed a gastric volume of approximately 1.6 ml/kg.The decision was made to delay the case until 0930, two hours since the juice was consumed. A repeat gastric US was performed at that time and showed no residual gastric continents. Patient underwent the procedure with general anesthesia and placement of ETT. An orogastric tube was passed after securing the airway and no gastric contents were aspirated. The surgery was completed uneventfully.

FIGURES



A: Pre-op gastric ultrasound in supine position showing "frosted-glass" pattern in which air accumulated along the anterior wall and casts a shadow artifact that obscures ingested fluid and all deeper structures

B & C: Pre-op ultrasound in right lateral decubitus position with fluid clearly visible. Measurements: Diameter of 2.48 cm and 1.15 cm, Circumference 6.86 cm, Area 2.80 cm^2.

D: Repeat ultrasound in two hours post consumption of juice in right lateral decubitus position showing no further gastric contents.

Formulas For Calculating Gastric Volume
(A) Gastric fluid volume = 27 + 14.6 x right lateral CSA – 1.28 x age
(B) Gastric fluid volume = -7.8 + 3.5*(RLD CSA) + (0.127) x (age in months)
(C) Gastric fluid volume = 3.7 + 6.5 x (RLD CSA cm 2) – 3.9 (supine CSA) + 1.7 x grade

Table 1: Formulas For Calculating Gastric Volume. Formulas used in various studies to quantify the gastric volumes of patients.
A: Used for calculating gastric fluid volume in adults (3)
B: Used for calculating gastric fluid volume in pediatric patient (5)
C: Used for calculating gastric volume in infants (1)

Qualitative Grading System For Gastric Ultrasound	
Grade 0	Antrum empty in both supine and RLD positions
Grade 1	Antrum empty in supine position but fluid visible in RLD position
Grade 2	Fluid visible in both supine and RLD position

Table 2: Qualitative Grading System For Gastric Ultrasound. (5)

DISCUSSION

Gastric ultrasound is a quick and noninvasive way to assess the gastric contents of the perioperative patient. It can provide a qualitative description of the contents, solid vs liquid, as well as quantitative measure of the volume of the contents. There are various formulas that can be used to calculate the volume based on the cross sectional area (CSA) as detailed in Table 1. Gastric volumes of up to 1.5 ml/kg can be seen in appropriately fasted adult patients and are considered a normal physiologic amount (3). The generally accepted amount to be considered an empty stomach for the pediatric patient is 1.25 ml/kg (1). Given that this patient was calculated to have a gastric volume of 1.6 ml/kg, this case was appropriately delayed until the patient was NPO for two hours from ingestion of the clear liquids. In addition to quantitatively calculating the gastric volume, the gastric ultrasound can also be graded qualitatively from 0-2 as detailed in Table 2. The higher the grade the more gastric content that is likely to be found in the stomach and increase the risk of aspiration (2,5).

CONCLUSIONS

This experience highlights the importance of reliable history taking and using interpreters in the patient's primary language to ensure adequate and correct communication. Furthermore, it solidifies gastric ultrasound as a reliable tool for safeguarding against perioperative complications in vulnerable populations where the perioperative interview may not be reliable.

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