Section: Anesthesiology

Original Research Article

PREOPERATIVE GASTRIC POCUS IN PATIENTS OF QUESTIONABLE FASTING STATUS

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Abstract

Background: Perioperative pulmonary aspiration remains a significant anesthetic risk, contributing to mortality despite adherence to fasting guidelines. Gastric point-of-care ultrasound (POCUS) has emerged as a non-invasive tool for assessing residual gastric content, particularly in patients with questionable fasting status. **Materials and Methods:** A prospective observational study was conducted at our hospital over six months, involving 300 patients at risk of delayed gastric emptying. Gastric POCUS was performed preoperatively, and residual gastric content based on antral cross-sectional area and content were categorized into risk grades. Patients classified as high risk (Grade 2) underwent tailored anaesthetic management, including repeat POCUS following prokinetic administration or alternative airway strategies. **Result:** Among 300 patients, 21 (7%) exhibited Grade 2 POCUS findings despite meeting fasting guidelines. Diabetes (OR = 3.15, $p < 0.05$), chronic kidney disease (OR = 5.8, $p < 0.05$), and combined DM+CKD (OR = 8.9, $p < 0.05$) were significantly associated with delayed gastric emptying. Tailored perioperative strategies enabled a safer anaesthetic approach, reducing unnecessary rapid sequence induction and avoiding aspiration events in all patients. **Conclusion:** Gastric POCUS effectively identified patients at risk of aspiration and facilitated individualized perioperative planning. Routine incorporation of gastric ultrasound into preoperative evaluation, particularly in high-risk populations, may enhance patient safety by preventing aspiration while optimizing anesthetic management.

INTRODUCTION

Perioperative aspiration pneumonitis incidence being 0.8% attributed to approximately 9% of anesthesia related mortality as highlighted in the Royal College of Anesthetists 4th National Audit project [1-3]. Aspiration leads to greater than 50 percent airway related mortality in anesthesia 3. Despite well-established international fasting guidelines are present for healthy volunteers, there is a knowledge gap in the same for patients at higher risk of aspiration due to their unreliable/impaired gastric prokinesis. Anti-aspiration prophylaxis with employment of rapid sequence induction and intubation is not devoid of aspiration [4]. Additionally, rapid sequence induction is not without complications like desaturation, hypotension, difficult airway.

Gastric point of care ultrasound (POCUS) is a simple, bedside, noninvasive diagnostic tool to estimate the residual gastric volume and tailor the anesthetic management based on patient and surgical factors. Being cost effective with an easy learning curve, this diagnostic method is of growing clinical interest. Gastric POCUS not only helps in identifying gastric volume in patients with risk factors but also verifying the fasting status in patients with unreliable fasting compliance (patients with altered sensorium, psychiatric history, dementia and pediatric patients). Gastric POCUS helps in confirming the fasting status in patients who are prone to delayed gastric prokinesis (patients with diabetes, chronic kidney disease causing uremic gastropathy, stress induced

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gastropathy in patients with prolonged ICU stay). Gastric POCUS done routinely in healthy patients without any risk factors have also showed significant residual volume despite adequate fasting. Newer directives recommend extending the use of gastric POCUS to pediatric population for verification of fasting status [5].

MATERIALS AND METHODS

Following the approval from the institutional ethical committee, this prospective observational study was done in our hospital over a period of 6 months from February to August 2024. We included patients aged >18years, patients with probable risk of delayed gastric emptying like those with diabetes, chronic kidney disease with uremic gastropathy, critical illness gastropathy, morbid obese patients posted for elective surgeries.

Patients with previous bariatric surgical history, acute abdominal pathology, dressing or wound at the site of gastric POCUS examination, pregnant patients and those who didn't consent were excluded from the study.

After obtaining written informed consent, 300 patients who were included in the study underwent gastric POCUS in the preoperative holding area. Gastric sonography was done in the right lateral or semi recumbent position of 45 degrees head up position [6]. Sonographic findings of residual gastric content [7] were graded 0 or empty, 1 or low risk and 2 or high risk. Patients with an empty stomach show a doughnut (hyperechoic opposing mucosal wall; hypoechoic muscularis propria and hyperechoic serosa). Presence of clear liquid(hypoechoic) or liquid air mixture (starry night pattern) mandates the estimation of the content. This is done by estimating cross-sectional areas which are further used in the Perlas table [8] as per the age of the patient to determine the residual gastric volume. If this volume is greater than 1.5ml per kilogram body weight of the patient, then classified as high risk or grade 2 while less than 1.5ml per kilogram of body weight as low risk / grade 1 [7]. Tailored perioperative anesthetic plan based on the patient, surgical indication and timing was taken based on the gastric POCUS finding. In patients for elective procedure, prokinetic medication was given followed by repeat scanning 2 hours later was done to ensure empty/low risk status and then proceed for surgery.

RESULTS

This study analyzed a sample of 300 patients, where pre-operative gastric ultrasound (POCUS) was utilized to evaluate the risk for aspiration. Among these patients, 21 of them (7%) met the study criteria with grade 2 POCUS findings, defined as having a full stomach with solid or mixed contents even while adhering to prescribed fasting guidelines.

Statistical analysis of the association between the various comorbidities and their POCUS Findings have been summarized in [Table 1 and Figure 1]. Patients with diabetes mellitus (DM) showed statistical significance ($p < 0.05$) and were more likely to have grade 2 findings than nondiabetics (Odds Ratio [OR] = 3.15), which may indicate possible delayed gastric emptying in this cohort [Table 2]. There was a statistically significant association ($p < 0.05$), with chronic kidney disease (CKD) patients being 5.8 times more likely to have grade 2 findings (OR = 5.8), which suggests that there is a strong association of CKD with impaired gastric emptying [Table 3]. The worst patient's combination was those with DM and CKD because they were 8.9 times more likely to have grade two findings ($p < 0.05$). There is strong interaction between these comorbidities regarding gastric emptying delay [Table 4]. Hypothyroidism, obesity alone or along with DM do not appear to be robust predictors of gastric retention.

Focus on The Effects on Perioperative Management: Regardless of following the minimum fasting period, 21 patients were noted to have grade 2 POCUS findings, 9 patients (≈ 43%) had repeat gastric ultrasound around 2 hours following the initial scan with additional pro kinetic measures showed grade 0 or 1 in repeat gastric Pocus performed prior to the surgery. This allowed a more liberal anesthetic plan. 3 other patients were able to proceed with surgery using a peripheral nerve block so general anesthesia could be avoided. The remaining 9 patients with grade 2 findings had to proceed for surgery with adequate precautions and rapid sequence induction and intubation. This provided protective airway management for patients with a high aspiration risk.

Importantly, during the entire study, no cases of perioperative pulmonary aspiration were noted within the sample of 300 patients, thus underscoring the possible use of gastric ultrasound in anesthetic decision making. These results indicate that pre-operative ultrasound of the stomach may offer an accurate assessment of risk in real time, thus allowing for customized anesthetic care and improving safety for patients.

Table 1: Summary Table: Comorbidities vs. POCUS Grade 2.

Comorbidity Group	p-value	Odds Ratio	Interpretation
Diabetes Mellitus (DM)	0.032	3.15	Not statistically significant, but trend suggests increased risk
Chronic Kidney Disease (CKD)	0.0003	5.8	Significant association: CKD patients are 5.8× more likely to have Grade 2 POCUS findings
DM + CKD	0.0001	8.9	Strongly significant; DM+CKD patients are 8.9× more likely to have Grade 2 POCUS findings

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DM + Obesity	0.154	2.1	No significant association; slight trend toward increased risk
Obesity	0.1	0.45	No significant association: obesity alone is not a strong predictor
Hypothyroidism	0.079	0.0	No significant association: hypothyroid patients had no Grade 2 findings

Table 2: Diabetes Mellitus (DM) vs. POCUS Grade 2

	POCUS Grade 2	POCUS Grade 0/1	Total
DM	18 (9.0%)	183 (91.0%)	201 (100%)
No DM	3 (3.0%)	96 (97.0%)	99 (100%)
Total	21 (7.0%)	279 (93.0%)	300 (100%)

Interpretation: Statistically significant ($p < 0.05$), with higher odds ratio (OR = 3.15).
Fisher Exact p value – 0.032. Statistically significant
OR – 3.15 (1.87 – 4.41)

Table 3: Chronic Kidney Disease (CKD) vs. POCUS Grade 2

	POCUS Grade 2	POCUS Grade 0/1	Total
CKD	6 (25.0%)	18 (75.0%)	24 (100%)
No CKD	15 (5.0%)	261 (95.0%)	276 (100%)
Total	21 (7.0%)	279 (93.0%)	300 (100%)

Interpretation: Statistically significant ($p < 0.05$). CKD patients are 5.8× more likely to have Grade 2 POCUS findings.
Chi sq. p value – 0.0003. Statistically significant
OR – 5.8 (4.71 – 6.88)

Table 4: DM + CKD vs. POCUS Grade 2

	POCUS Grade 2	POCUS Grade 0/1	Total
DM + CKD	6 (33.0%)	12 (67.0%)	18 (100.0%)
No DM + CKD	15 (5.0%)	267 (95.0%)	282 (100.0%)
Total	21 (7.0%)	279 (93.0%)	300 (100%)

Interpretation: Strongly significant ($p < 0.05$). DM+CKD patients are 8.9× more likely to have Grade 2 POCUS findings.
Chi sq. p value – 0.0001. Statistically significant
OR – 8.9 (2.93 – 26.99)

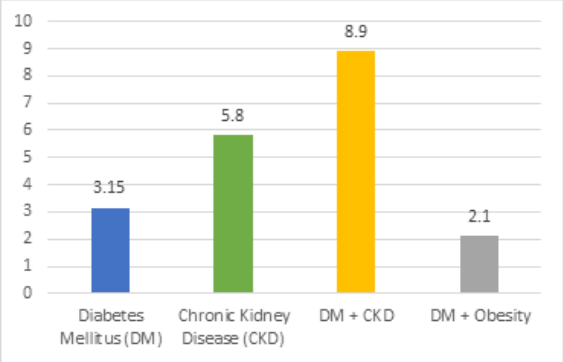

Figure 1: Odds Ratio for POCUS grade 2

DISCUSSION

Our research emphasizes the importance of using gastric ultrasound prior to surgery because it as-sists in predicting the risk for aspiration and helps in tailoring anaesthetic techniques. Even while following fasting instructions, some patients had a high-risk stomach at the time of anaesthetic induction, [9,10] which is an example of how fasting periods are insufficient on their own as a risk determinant for aspiration [11,12]. Gastric ultrasound was helpful as it provided a real-time assessment at the time of management, enabling real-time changes where necessary [7].

Curiously 21 patients had grade 2 findings on the gastric ultrasound, which is indicative of a full stomach, even when fasting according to the standard protocol. Out of these, 9 patients underwent a repeat scan before surgery which is done after all the other scans have been conducted and was found to be grade 0 or 1, which is less than or equal to normal enabling liberal airway management. 3 patients who had grade 2 proceeded with surgery under a more peripheral nerve block and avoided the general anaesthetic all together. The remaining 9 patients had their rapid sequence induction (RSI) and had endotracheal intubation for protection from aspiration. It is worth noting that there were no cases of aspiration during the surgery reported between 300 patients used in the study, reaffirming the importance of ultrasound for safe anaesthetic decisions [9,13].

The adoption of routine gastric ultrasound either confirmed low risk patients could be intubated without concern or identified those needing a cautious approach, influencing anaesthetic plans. It also reduced unnecessary RSI in some elective surgery patients due to more liberal airway management. In contrast, it allowed prompt recognition in the emergency scenario of those patients who did need RSI. This approach might help reduce the risk of aspiration while still minimizing the damage to hemodynamics and the airway from unwarranted intubation [4,14,15].

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Analysis of various comorbidities revealed certain conditions associated with increased residual gastric content and we demonstrated certain important correlation as evidenced by other studies. Diabetic patients showed greater inclination towards grade 2 POCUS findings [16]. Patients with chronic kidney disease demonstrate sonographically prolonged gastric emptying,[17] and the risk is amplified significantly further in patients who have concomitant diabetes. Obese patients showed similar residual gastric volume ml per kg as evidenced by their non-obese counterparts but an increased baseline antral cross-sectional area [18]. Further the gastric prokinesis may be delayed further in patients on glucagon-like peptide-1 receptor agonist, glucose-dependent insulinotropic peptide agonists warranting mandatory preoperative gastric ultrasound in such patients. [19]

While some limitations remain, our findings validate the use of gastric ultrasound in surgical preparation. In addition, while the Perlas formula and 1.5 mL/kg cutoff for high-risk gastric content are widely accepted, these are still estimating rather than guarantees for aspiration risk [20]. Other concerns include variability between operators, which was lessened through the structured training received.

CONCLUSION

Our study further strengthened the existing evidence on the importance of gastric POCUS in optimising a tailored anaesthetic plan after truly differentiating high risk patients from the low risk and thereby reducing unnecessary restrictive airway management as against liberal management and its sequel. Routine incorporation of gastric ultrasound into pre-anaesthetic evaluation, especially for patients with metabolic or renal dysfunction, morbid obesity could enable precise perioperative anaesthetic management and thereby significantly improve patient safety.

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REFERENCES

1. Warner MA, Meyerhoff KL, Warner ME, Posner KL, Stephens L, Domino KB. Pulmonary as-piration of gastric contents: a closed claims analysis. Anesthesiology. 2021;135(2):284–91.
2. Sun J, Wei G, Hu L, Liu C, Ding Z. Perioperative pulmonary aspiration and regurgitation with-out aspiration in adults: a retrospective observational study of 166,491 anesthesia records. Ann Pal-liat Med. 2021;10(4):4037–46.
3. Cook TM, Woodall N, Frerk C. Major complications of airway management in the UK: results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 1: anaesthesia. Br J Anaesth. 2011;106(5):617–31.
4. Neilipovitz DT, Crosby ET. No evidence for decreased incidence of aspiration after rapid se-quence induction. Can J Anaesth. 2007;54(9):748–64.
5. Frykholm P, Disma N, Andersson H, et al. Pre-operative fasting in children: a guideline from the European Society of Anaesthesiology and Intensive Care. Eur J Anaesthesiol. 2022;39(1):4–25.
6. Van de Putte P, Perlas A. Ultrasound assessment of gastric content and volume. Br J Anaesth. 2014;113(1):12–22.
7. Perlas A, van de Putte P, van Houwe P, Chan VWS. I-AIM framework for point-of-care gastric ultrasound. Br J Anaesth. 2016;116(1):7–11.
8. Perlas A, Mitsakakis N, Liu L, et al. Validation of a mathematical model for ultrasound assess-ment of gastric volume by gastroscopic examination. Anesth Analg. 2013;116(2):357–63.
9. Baettig SJ, Filipovic MG, Hebeisen M, Meierhans R, Ganter MT. Pre-operative gastric ultra-sound in patients at risk of pulmonary aspiration: a prospective observational cohort study. Anaes-thesia. 2023;78(11):1327–37. doi:10.1111/anae.16117.
10. Perlas A, Davis L, Khan M, Mitsakakis N, Chan VWS. Gastric sonography in the fasted surgi-cal patient: a prospective descriptive study. Anesth Analg. 2011;113(1):93–7.
11. Van de Putte P, Vernieuwe L, Jerjir A, Verschueren L, Tacken M, Perlas A. When fasted is not empty: a retrospective cohort study of gastric content in fasted surgical patients. Br J Anaesth. 2017;118(3):363–71.
12. Ohashi Y, Walker JC, Zhang F, Prindiville FE, Hanrahan JP, Mendelson R, Corcoran T. Pre-operative gastric residual volumes in fasted patients measured by bedside ultrasound: a prospective observational study. Anaesth Intensive Care. 2018;46(6):608–13.
13. Flynn DN, Doyal A, Schoenherr JW. Gastric ultrasound. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022.
14. Klucka J, Kosinova M, Zacharowski K, et al. Rapid sequence induction: an international sur-vey. Eur J Anaesthesiol. 2020;37(5):435–42.
15. Lentz S, Grossman A, Koyfman A, Long B. High-risk airway management in the emergency department. Part I: diseases and approaches. J Emerg Med. 2020;59(1):84–95.
16. Zhou L, Yang Y, Yang L, et al. Point-of-care ultrasound defines gastric content in elective sur-gical patients with type 2 diabetes mellitus: a prospective cohort study. BMC Anesthesiol. 2019;19(1):179. doi:10.1186/s12871-019-0848-x.
17. Sharma S, Raman P, Deo AS. Comparative preoperative sonological assessment of gastric con-tents in patients with chronic kidney disease versus those with normal renal function: a prospective observational study. Indian J Anaesth. 2023;67(6):503–8. doi:10.4103/ija.ija_82_22.
18. Van de Putte P, Perlas A. Gastric sonography in the severely obese surgical patient: a feasibility study. Anesth Analg. 2014;119(5):1105–10. doi:10.1213/ANE.0000000000000373.
19. El-Boghdadly K, Dhesi J, Fabb P, et al. Elective peri-operative management of adults taking glucagon-like peptide-1 receptor agonists, glucose-dependent insulinotropic peptide agonists and sodium-glucose cotransporter-2 inhibitors: a multidisciplinary consensus statement. Anaesthesia. 2025;80(4):412–24. doi:10.1111/anae.16541.
20. Godschalx V, Vanhoof M, Soetens F, et al. The role of gastric ultrasound in anaesthesia for emergency surgery: a review and clinical guidance. Eur J Anaesthesiol Intensive Care. 2023;2(4):e0027. doi:10.1097/EA9.0000000000000027.

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