Editorial

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Probing the future - Can gastric ultrasound herald a change in perioperative fasting guidelines?

Pulmonary aspiration of gastric contents is a dreaded perioperative complication, accounting for nearly 9% of anaesthesia-related deaths.[1-3] The Fourth National Audit Project by the Royal College of Anaesthetists of the United Kingdom reported pulmonary aspiration as the cause of death in more than 50% of airway management incidents.[4] Solids, particulate matter, large volume or higher acid content of the aspirate carry higher morbidity and mortality.[5]

Immediate preoperative assessment of the nature and volume of gastric content is currently based on a patient's history and the adherence to prevailing fasting guidelines. Emergency situations generally mandate a modification in the anaesthesia plan.[6,7] The American Society of Anesthesiologists' guidelines for healthy adults (not associated with conditions that delay gastric emptying or increase gastric volume) consider a minimum fasting duration of 2 h for clear fluids, 6 h for a light meal and 8 h for a fatty meal, fried foods or meat to be safe.[6] Despite this practice, the incidence of pulmonary aspiration in healthy fasted individuals is about 1:4000.[8] In addition, guidelines do not provide specific fasting durations for 'at risk' patients.

The past decade has seen a paradigm shift in the way airway management is practised. There is an increasing preference amongst anaesthesiologists towards use of newer generation supraglottic airway devices for primary airway management in adequately fasted patients, including those who are historically considered 'at risk' for gastric aspiration.[9,10] Neuromuscular blockade is now administered without checking the ability to mask ventilate.[11] Gentle positive pressure ventilation with bag and mask at airway pressures below the lower oesophageal sphincter pressure is now considered acceptable as a part of modified rapid sequence induction, especially for patients at risk for rapid desaturation.[12] Considering this backdrop, it is worthwhile to pause and reflect whether current fasting guidelines need to be queried, and how, if at all, new technologies can help us enhance both the comfort and safety of patients who require anaesthesia. Measurement of gastric volume has been deliberated as an avenue to produce reliable markers for deciding which patient is actually 'at risk'.[8,13,14] Could it also help us decide who should fast for how long, prior to, as well as after anaesthesia?

Gastric scintigraphy is the gold standard for assessing gastric contents but is not suitable for routine use.[13] Simple bedside techniques such as gastric content aspiration are unreliable and uncomfortable for awake patients. On the other hand, procedures based on electrical impedance tomography, radio-labelled diet, absorption characteristics of paracetamol, polyethylene glycol dilution and magnetic resonance imaging are untenable for use in the perioperative period due to their complexity.[5,13-15] Gastric ultrasound (GUS) being a simple non-invasive procedure is emerging as a point-of-care tool for assessing gastric contents. The antrum, the most dependent part of the stomach, can easily be identified in adults (98–100% instances) using a low frequency curvilinear probe with patients in right lateral decubitus position.[5,13] Moreover, assessment of the antrum when at rest (when there is no peristaltic activity) accurately reflects contents of the entire stomach.[8,13,14] When correctly performed, visualisation of an empty antrum (flat with its walls juxtaposed or a bull's eye/target pattern) indicates low aspiration risk. When the antrum is not empty, quality of the contents is assessed. Frosted glass patterning or multiple ring-down artefacts obscuring the posterior antral wall indicate a high aspiration risk (solid/particulate matter). Anechoic or hypoechoic contents (clear liquid) or a starry night pattern (air and liquid) requires quantitative estimation. If the volume is <100 mL or <1.5 mL/kg in adults, it is generally assumed to be safe or at low risk for aspiration. These specific cut-off values for gastric volume were derived from the maximal residual gastric volumes observed in adequately fasted patients without any coexisting risk factors for aspiration.[8,13,14] This is in contradiction to the current fasting guidelines which were developed considering a residual gastric volume of >25 mL or a gastric pH of <2.5 to be significant, even lethal, if aspirated.[3,6] Interestingly, consumption of clear fluids or carbohydrate beverages 2–4 h prior to surgery had shown a reduction in residual gastric volume and increase in the pH, though more recent studies have returned equivocal results.[6,15,16] Though GUS cannot assess the pH of gastric contents, its reliability in identifying unsafe gastric volume/content has led to alterations in the course of management for patients who did not meet standard fasting criteria.[8,13,14]

This issue of *Indian Journal of Anaesthesia* features two articles on GUS.[17,18] These articles re-emphasise that the presence of associated risk factors for aspiration such as diabetes mellitus, chronic kidney disease, reflux gastro-oesophageal disease etc., contributes to delayed gastric emptying and increased residual gastric volume. However, the most concerning outcome from both articles is the detection of solid/particulate matter or unsafe residual gastric volumes in healthy adults presumably at low risk for aspiration, despite an adequate duration of fasting.[17,18] These findings arouse some disquieting queries: Why did only a select few patients have this problem? Will further evaluation of such patients help to identify any special risk factors inherent to these presumably fit patients? Was prolonged duration of fasting responsible for excess gastric volume, especially because patients do not routinely consume sufficient clear liquids 2–4 h prior to the scheduled procedure, despite instructions?

The review of evidence on perioperative GUS thus far raises certain pertinent questions. Is a safe residual gastric volume of <100 mL or <1.5 mL/kg too stringent? Should GUS be routinely used to assess residual gastric content in all patients irrespective of fasting status? If so, is this a viable option? Or would false positives contribute to unnecessary delays or cancellation of elective procedures? Will GUS have a role in resuming feeds in the postoperative period? Can GUS guide anaesthesia and airway management plans for patients with unsafe residual gastric content/volume? Will GUS establish or extinguish the role of prokinetics, anti-aspiration prophylaxis or drainage of contents by a gastric tube? One remains hopeful that future research will lend gravity to these conjectures.

With current restrictions imposed on the use of ultrasound by the Government of India and the limited availability and accessibility to ultrasound in our country, research may be directed towards deriving specific durations of fasting for different categories of patients based on GUS.

With so much focus and hope on future studies involving GUS, what should be our current stance on GUS and fasting status? Since pulmonary aspiration is an interplay of various factors, even though GUS is undoubtedly a stellar tool, its role currently appears limited to assessing gastric content. When a high-risk profile for aspiration is identified by GUS, it definitely merits caution. In an elective scenario, that would imply waiting till the profile returns to low risk. How frequently would re-evaluation be required in such situations is a relevant question. In emergent situations, techniques and approaches that beneficially combine the 'full stomach' protocols and the airway management protocols can lessen the risk of regurgitation and aspiration.

Should the current fasting guidelines be altered based on GUS findings? The current evidence perhaps justifies initiating serious deliberations to this end. Irrespective of the answer, however, it is time for anaesthesiologists to familiarise with GUS and include GUS in teaching curriculums. GUS is an easy to acquire skill requiring 24 and 33 scans, respectively (followed by expert feedback), to achieve 90% and 95% accuracy.[19] Even higher accuracies can be achieved with better pattern recognition skills. Future research in GUS for assessment of pulmonary aspiration risk may need to focus on the training requirements to acquire this skill and studies to validate volume assessment in obstetric and paediatric populations. Improvement in ultrasound technology may help refine the existing models for qualitative and quantitative assessment of gastric contents.

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