EDITORIAL

Gastric Ultrasound: POCUSing an Intolerant GUT!

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Delivering optimum nutrition is one of the important aspects of critical care. While enteral feeding is most preferred due to its overall advantage, enteral feed intolerance (EFI) is a major hindrance to it. Enteral feed intolerance is not uncommon in the intensive care unit (ICU) and is associated with the risk of aspiration pneumonia and contributes to mortality and morbidity in ICU.[1] Hence, monitoring EFI is an essential safety measure and a standard ICU practice. The signs and symptoms of EFI such as vomiting or regurgitation, diarrhea, bowel distension, and large gastric residual volume (GRV) have been shown to be strongly associated with increased ICU mortality.[2]

Diagnosing EFI is among the most contentious issues in ICU due to the lack of a universally acceptable definition and limitations of accurate measurements of GRV.[3] In the absence of a unified definition, a pragmatic definition may be used when an individual physician decides to stop or reduce feeding in presence of gastrointestinal (GI) symptoms and/or high GRV.

Accurate measurement of GRV is equally challenging. Traditionally, stomach contents are aspirated at a fixed interval to measure the GRV. The accuracy of this method is confounded by factors such as the position of the tip of the feeding tube, tube collapsibility, tube size, type of tube (e.g., PEG tube), the volume of syringe used, and operator's performance.[4]

Gastric ultrasound is emerging as a method of estimating GRV in critically ill patients. Primarily use of gastric ultrasound has emerged in the risk stratification of aspiration events perioperatively. Both quantitative and qualitative measurements of gastric content are possible and reproducible with bedside antral volume measurements in preoperative patients.[5] In critically ill ICU patients, measurement of the antral cross-sectional area has shown a good correlation with GRV in a recent study.[6] However, the measurement of GRV using gastric ultrasound correlating gastric symptoms of EFI has not been studied.

In this issue of *Indian Journal of Critical Care Medicine*, Ankalagi et al.[7] has done a pilot study correlating GRV, as measured by bedside gastric ultrasound, with symptoms of EFI. This is a small prospective study of 43 patients done in multiple ICUs of a single center for a period of 18 months. They included all the adult patients, in whom nasogastric feeds were to be initiated. They have excluded patients having GI tract involvement (medical and surgical), nasojejunal feeds, patients requiring high or multiple vasopressors, and pregnant females. Enteral feeds were started as a continuous infusion for 16 hours after aspiration of gastric contents followed by a break of 8 hours. Each day was considered one session and a total of 130 sessions (feeding days) were evaluated in these 43 patients. The authors have used ultrasound technique of measuring GRV in right lateral decubitus position proposed by Perlas et al.[8]

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The gastric content was aspirated at start of each session, and five readings were made with baseline and then hourly. Treating physicians, who were blinded to ultrasound findings diagnosed EFI based on clinical endpoints such as abdominal pain, discomfort, abdominal distention, regurgitation, or vomiting.

There were 13 episodes (10%) of feed intolerance which correlated well with ultrasound-measured GRV in descending order at 4, 3, 1, and 2 hours. The sensitivity and specificity of GRV in identifying feed intolerance was highest (100 and 99%, respectively) at 4 hours and lowest (85 and 84%, respectively) at 2 hours. This study indicates a good correlation between ultrasound-measured GRV and symptoms of feed intolerance.

There are a few limitations to this single-center pilot study. Measurement of GRV at six hours of feeding is common practice. The European Society of Intensive Care Medicine (ESICM) guidelines suggest delaying enteral nutrition if GRV at 6 hours is above 500 mL.[9] As authors have not measured GRV using ultrasound at six hours, it may be difficult to apply study results in centers where GRV measurement at 6 hours is practiced. It will be interesting to know the baseline volume measured at G0. The presence of gastric juices at baseline and in subsequent hours contributing to the volume also needs to be considered. It is known that the pathophysiology of gastric emptying and juice secretion is quite complex and multi-faceted in critically ill ICU patients.[10] The EFI group had a cut-off value of 216 mL at 4 hours for predicting feed intolerance. Whether this value can be used as a threshold for starting pro kinetics or stopping feeds needs to be explored.

Patients receiving vasopressors, opioids, or having GI pathology (medical and surgical) are at risk of feed intolerance.[10] These patients were not included. Hence, the results cannot be extrapolated to this patient population.

Enteric feed is a generic term that includes a variety of preparations such as regular, semi-elemental, or elemental formula feed and even kitchen feed in some centers. The calorie content of feed may also vary (1 or 2 cal/mL). It needs to be seen if GRV cut-offs need to be tailored to different feed preparations.

The study provides precise GRV cut-off volumes for correlation with EFI symptoms and adds to the current knowledge of the application of gastric ultrasound in critically ill ICU patients.

The majority of the previous work using gastric ultrasound has been done in perioperative patients to determine "fasting state." This is in context of high aspiration risk in non-fasting state during preoperative period. The bed side availability, quantitative and qualitative assessment with good reproducibility makes a robust case for use of gastric ultrasound for anesthetist. For an intensivist, this study highlights application of gastric ultrasound for diagnosing feed intolerance which may possibly help in prevention of aspiration pneumonia in ICU. The follow-up work for this hypothesis-generating study can increase the applicability of gastric ultrasound in feeding protocol.

Areas that need focusing include evaluation in sicker, vasopressor-dependent patients, and patients on opioids. A study on reproducibility and correlation in ultrasound measurements in the lateral and supine positions may provide safer, less labor intensive, and practical option for ICU patients. Nevertheless, this study can be a good starting point for further extension of gastric ultrasound usage in the critically ill patients.

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