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An observational study to assess the gastric antral content in trauma patients using point of care ultrasound for aspiration pneumonitis prevention during emergency surgery

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Abstract

Introduction: Aspiration of gastric contents though rare in elective surgeries, is common with trauma patients who undergo emergency surgeries. Residual gastric contents pose high risk of aspiration pneumonitis during induction of anaesthesia. Point of care ultrasound assessment of gastric antral content helps the anaesthesiologist in prevention of pulmonary aspiration. So the aim of our study was to facilitate routine use of POCUS to assess gastric content as to assist us in the plan of anaesthesia.

Methods: 50 polytrauma patients undergoing emergency surgery were chosen and graded as high risk group or low risk group based on clinical assessment of the patient (history of fasting hours) and qualitative assessment of gastric antral content using POCUS prior to induction of anesthesia in the emergency department. Patients who had fasted for < 6 hours on clinical assessment and patients with liquid and solid contents on ultrasound imaging of the gastric antrum were regarded as high risk. Patients fasted for > 6 hours and those with empty gastric antrum were regarded as low risk.

Results: Out of 50 patients, 29 patients were considered high risk for aspiration after clinical assessment but it increased to 38 patients after Gastric antral ultrasound assessment. Also 21 patients who were considered low risk for aspiration after clinical history of last meal decreased to 12 patients after Gastric antral ultrasound assessment

Conclusion: Routine preoperative gastric ultrasound is a reliable, non invasive and safe tool for the assessment of gastric contents in emergency patients posted for surgery and for planning of anaesthetic management as to prevent aspiration

Keywords: Ultrasound, Trauma Patients, Gastric Antrum, Aspiration Pneumonitis.

Introduction

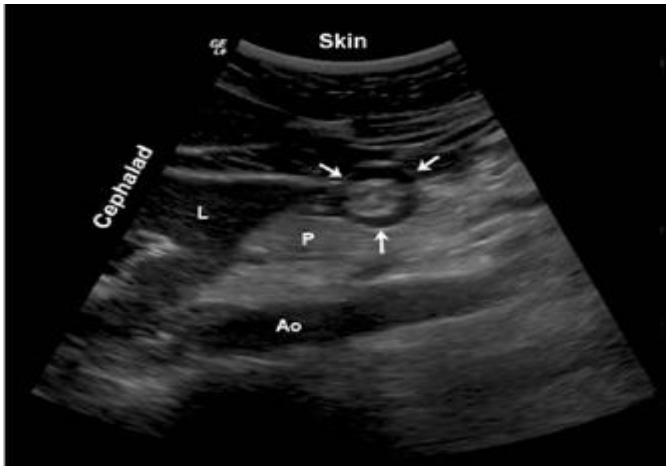
Pulmonary aspiration is a major life threatening complication that can occur with increased incidence in polytrauma patients. Aspiration risk is minimal in elective surgeries where the patients observe the fasting guidelines before being taken up for anaesthesia whereas in trauma patients when emergency surgery is a necessity, and there is delayed gastric emptying due to trauma, there is definitely a very high risk of aspiration pneumonitis. Aspiration, a nightmare to anaesthesiologists can be best prevented if the status of the patient's gastric content is known and the same can be done in a feasible way,that is less invasive to the patient and technically easy for the anaesthesiologist. Point of focus ultrasound (POCUS) is such a diagnostic tool which is easily available at the bedside, reliable, less invasive and less expensive. POCUS is widely used at the bedside nowadays to diagnose numerous problems like pneumothorax, cardiac tamponade, organ injuries etc. Along with FAST performed for all poytrauma patients, it is always easy to carry out a simple gastric antral content assessment which closely corresponds to gastric status of the patient. So we have done this study to depict the importance of routine POCUS for pulmonary aspiration prevention in trauma patients.

Methodology

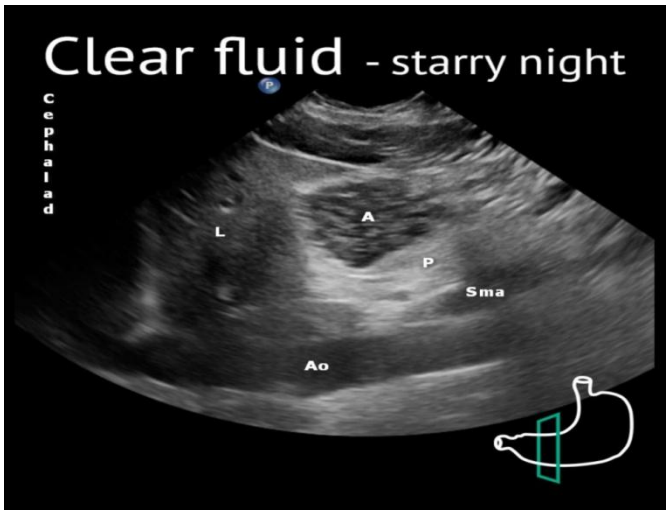
After obtaining Institutional Ethical Committee clearance and informed consent from the patient, an observational study was performed on 50 polytrauma patients at Coimbatore medical college hospital, Coimbatore. Patients of both sexes in the age group of 18 to 60 years of age having a Body Mass Index (BMI) <40, Glasgow Coma Scale (GCS)>10 and Blood pressure (BP) >100/60 mmhg were included in the study. Apart from GCS assessment, clinical assessment which included the history elicitation about the fasting status, complete laboratory and radiological examinations based on the patient's condition were done. Patients with gastrointestinal malignancies, history of upper gastrointestinal surgeries, gastroesophageal reflux diseases, impaired GCS (<10), fractured skull base, severe bleeding were excluded from the study. Clinical assessment in terms of time of the last meal in the desired patients was compared with the gastric antral content assessment.

A low frequency (2-5 Hz) curvilinear probe was used to assess the gastric content in all the studied patients. Ultrasound assessment was done in supine and right lateral decubitus positions for each patient. The probe was placed in the epigastrium beneath the xiphoid, superior to the umbilicus at sagittal plane for locating the gastric antrum. The anatomical landmarks that helped us were liver anteriorly, pancreas posteriorly, aorta and inferior vena cava. If the antrum is empty, then it will resemble the target of a "Bull's eye" as the anterior and posterior walls were very close to each other when collapsed and flat.

SAGITTAL SONOGRAM OF EMPTY ANTRUM RESEMBLING TARGET OF BULL'S EYE (Arrow heads).L=Liver, Ao=Aorta, P=Pancreas



When filled with transparent liquid, the antrum would appear to expand in a circle and mimicks the formation of a "starry night" as several gas bubbles would appear as punctuated hyperechoic regions within the hypoechoic fluid.



Sagittal sonogram of gastric antrum showing 'starry night" appearance.L=liver, A=antrum, P=Pancreas, Ao=Aorta, Sma=superior mesenteric artery.

Whenever gastric antrum was filled with solid contents, "frosted glass appearance" was seen due to mixed echo contents as depicted below:

The risk grading into high risk and low risk was done based on the clinical assessment and POCUS. When assessing by ultrasound, patients with solid and liquid content in gastric antrum as depicted by characteristic appearance mentioned above were considered as high risk and with clinical assessment patients fasted for less than 6 hours were considered as high risk for general anaesthesia. High risk patients were accepted for general anaesthesia after aspiration of gastric contents by a Ryle's tube thus preventing aspiration pneumonitis.

Statistical analysis: The statistical analysis was done using IBM SPSS statistics version 22. The categorical datas in our study were analysed using Chi-square test as all are qualitative data.

Results:

In our study, 29 patients out of 50 were considered as high risk for aspiration after clinical assessment considering the history of last meal; which increased to 38 patients after performing a gastric antral ultrasound assessment. Patients considered as low risk for aspiration was 21 with clinical assessment which decreased to 12 patients with ultrasound assessment of the gastric antrum.

Discussion

In this prospective observational study, we found that use of POCUS to assess the high risk for aspiration is definitely significant as compared to clinical assessment which is proved by statistical difference (p value<0.05 significant). So it is recommended to perform a routine gastric antral content assessment using POCUS.

Aspiration pneumonitis is a major life threatening complication in patients who are taken up for emergency surgeries, especially trauma patients. The major reason for this is that the lower oesophageal tone is decreased to a great extent during sedation or general anaesthesia. In addition, the airway reflexes are also decreased after an anaesthetic induction agent is infused to a patient.

Delayed gastric emptying commonly noticed with trauma patients adds to the risk of aspiration. Gastrointestinal motility is definitely affected by stress, trauma, anxiety, pain and use of opioid analgesia during a general anaesthesia.

The severity due to aspiration of gastric contents greatly depends on the gastric content, volume and acidity of the contents. Point of care ultrasound assessment of gastric content is more accurate in predicting the risk of aspiration than the clinical assumption of the gastric contents from the hours of fasting. POCUS assessment of gastric contents is more reliable, accurate and promising as it is non invasive, readily available bedside and relatively easy to perform.

Gastric ultrasound helps in aiding the decision of method of anaesthesia that can be performed for trauma patients. Whenever suitable, regional anaesthesia can be administered to trauma patients and if general anaesthesia is mandatory, rapid sequence induction can be practised. In our study, we inserted Ryle's tube for high risk patients as identified by bedside POCUS and aspirated the Ryle's tube to empty the gastric contents prior to induction of anaesthesia, thereby preventing aspiration pneumonitis in susceptible patients.

Conclusion

Hence we conclude that routine bedside ultrasound assessment of gastric contents is a safe, easy, reliable and promising tool in prevention of aspiration in polytrauma patients and also allows modification of anaesthetic methods as the suitation demands.

Conflicts of interest: none.

Limitations

We have not assessed the gastric volume in this study which is more accurate in the prediction of risk of pulmonary aspiration.

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