

# Endoscopic findings during placement of postpyloric feeding tubes in intensive care patients: a retrospective observational study

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Nutritional support is an essential component of the management of critically ill patients, and has a measurable effect on morbidity and mortality. Early enteral nutrition is feasible, cost-effective and improves patient outcomes.<sup>1</sup> Initiation of enteral nutrition within 24 hours of injury or intensive care admission has been shown to reduce mortality among critically ill patients and among trauma patients who require intensive care.<sup>2,3</sup>

Delayed gastric emptying often hampers the administration of enteral nutrition.<sup>4</sup> Treatment with prokinetic drugs has been shown to be effective in promoting gastric feeding in a subset of these patients, with the combination of erythromycin and metoclopramide producing the best results.<sup>5,6</sup>

However, when this treatment fails, enteral feeding using a postpyloric feeding tube is indicated. A multitude of techniques to insert postpyloric feeding tubes has been described, including endoscopic techniques, "blind" techniques and insertion under fluoroscopic guidance. Endoscopic insertion remains the "gold standard", with a high success rate and safety record.<sup>7-9</sup> One of the perceived benefits of this modality is the detection of previously unrecognised upper gastrointestinal (UGI) abnormalities.<sup>10,11</sup> However, the exact incidence and clinical significance of such abnormalities is not well established. Endoscopic methods also do not require radiology to achieve placement and the attendant risks of transporting a critically ill patient out of the intensive care unit.

We conducted a retrospective single-centre observational study to investigate the prevalence and clinical significance of new UGI abnormalities diagnosed in intensive care patients who underwent endoscopic insertion of a postpyloric feeding tube.

## Methods

We performed a single-centre retrospective observational study in the ICU of a tertiary referral teaching hospital in New Zealand. The study was approved by the Northern Y Regional Ethics Committee (approval no. NTY/11/EXP/074).

### Patient selection and data collection

All patients who underwent endoscopic postpyloric feeding tube insertion in the ICU between 1 January 2008 and 1 August 2011 were identified in our endoscopy database

## ABSTRACT

**Objective:** To investigate the prevalence and clinical significance of upper gastrointestinal (UGI) findings during endoscopic placement of postpyloric feeding tubes in intensive care patients.

**Design and setting:** A retrospective observational case study conducted at the intensive care unit in a single tertiary teaching hospital in New Zealand.

**Participants:** Intensive care patients who underwent postpyloric feeding tube insertion under endoscopic guidance, January 2008 – August 2011.

**Main outcome measures:** Endoscopic findings at tube placement and risk factors for UGI abnormalities. UGI abnormalities were considered to be clinically significant if recommendations for patient management or follow-up endoscopy were made.

**Results:** 19 patients underwent feeding tube placement during the study period and 17 endoscopy reports could be retrieved. UGI abnormalities were diagnosed in 16/17 patients: erosions from nasogastric tube (7), gastritis (4), oesophagitis (2), gastric ulcer (1) and duodenal ulcer (1). Seven patients had clinically significant endoscopic findings that prompted treatment recommendations. Risk factors for UGI abnormalities included previous UGI abnormalities in six patients and antiplatelet treatment in seven patients. In addition, our patient series was characterised by a high median Acute Physiology and Chronic Health Evaluation II score (24.5; interquartile range [IQR], 17.8–28.3) and Sequential Organ Failure Assessment score (9; IQR, 6–12).

**Conclusion:** Endoscopic placement of postpyloric feeding tubes resulted in the identification of a significant number of patients with previously undiagnosed UGI abnormalities.

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and included in the study. Endoscopy reports and medical notes were reviewed.

The following data were collected: demographic data, admission diagnosis (Australian and New Zealand Intensive Care Society description), Acute Physiology and Chronic Health Evaluation (APACHE) II score, Sequential Organ Failure Assessment (SOFA) score on admission, previous UGI

**Table 1. Patient characteristics**

| Variable                                    |                  |
|---|------------------|
| Mean age in years (SD)                      | 54 (21)          |
| Male, no. (%)                               | 14 (74%)         |
| Median admission APACHE II score (IQR)      | 24.5 (17.8–28.3) |
| Median admission SOFA score (IQR)           | 9 (6–12)         |
| Diagnostic group, no. (%)                   |                  |
| Cardiac                                     | 3 (16%)          |
| GI  | 4 (21%)          |
| Respiratory                                 | 6 (32%)          |
| Sepsis                                      | 3 (16%)          |
| Trauma                                      | 1 (5%)           |
| Other                                       | 2 (11%)          |
| Previous upper GI abnormalities, no. (%)    |                  |
| Gastritis                                   | 1 (5%)           |
| Duodenal ulcer                              | 2 (11%)          |
| Previous upper GI bleed                     | 2 (11%)          |
| Previous perforated ulcer                   | 1 (5%)           |
| Antiplatelet and anticoagulant use, no. (%) |                  |
| Aspirin                                     | 4 (21%)          |
| Clopidogrel                                 | 1 (5%)           |
| Low-molecular-weight heparin                | 1 (5%)           |
| Unknown                                     | 1 (5%)           |
| Gastroprotective medication use, no. (%)    |                  |
| Proton-pump inhibitor                       | 7 (37%)          |
| Unknown                                     | 1 (5%)           |

APACHE = Acute Physiology and Chronic Health Evaluation.

GI = gastrointestinal. IQR = interquartile range. SOFA = Sequential Organ Failure Assessment.

abnormalities, antiplatelet and anticoagulant medication use, proton-pump inhibitor or H<sub>2</sub> antagonist use, indication for endoscopy, endoscopic technique and success rate, and endoscopic diagnostic findings.

Endoscopic findings were considered clinically significant if they led to a treatment recommendation.

### Data analysis

Data are described as mean (SD) or median (interquartile range [IQR]). Odds ratios were calculated with 95% confidence intervals to determine possible associations between abnormal endoscopy findings and potential risk factors for endoscopic abnormalities: higher illness severity score (APACHE II score  $\geq$  20, and SOFA score  $>$  11), antiplatelet therapy use, and age.

### Results

Patient characteristics are detailed in Table 1. Nineteen patients underwent endoscopic postpyloric feeding tube insertion during the study period, of whom 14 were male

(74%), with a mean age of 54 years (SD, 21; range, 15–80 years). The median day of ICU admission on which endoscopy was performed was Day 5 (IQR, 4–8.5 days).

Respiratory and gastrointestinal diseases were the most common admission diagnoses, occurring in six (32%) and four (21%) patients respectively. Two patients (11%) had a history of duodenal ulcer and two had had a previous gastrointestinal bleed. Seven patients (37%) were on either antiplatelet or anticoagulant medication. Eight patients (42%) were on gastroprotective medications before postpyloric tube insertion. Feed intolerance, as evident by large gastric residual volumes (GRV), necessitated insertion of a postpyloric feeding tube in most patients (11; 58%). The measured GRV in all these patients was  $>$ 250 mL per 6 hours for two successive measurements, despite the use of prokinetic agents. Other reasons for insertion included aspiration (2; 11%), hyperkalaemia with total parenteral nutrition (1), and reinsertion of a blocked nasojejunal tube (1). Indication for postpyloric feeding was not stated for five patients (26%). Median APACHE II score on admission was 24.5 (IQR, 17.8–28.3) and median SOFA score on admission was 9 (IQR, 6–12). All patients were mechanically ventilated. Clinical records were unavailable for one patient.

### Endoscopic findings

In all cases, a nasojejunal feeding tube (NJFF-10, Cook Medical, Bloomington, Ind, USA; 10 Fr, 240 cm long) was inserted and positioned in the distal duodenum under direct vision through the working channel of a double-channel gastroscope (GIF-2TH180, Olympus Australia, Melbourne, Vic, Australia). Success rate was 100%.

Of the 17 patients with endoscopy reports in their records, one patient had normal endoscopic findings, and the remaining 16 had one or more abnormal endoscopic findings. The most common findings were erosions from a nasogastric (NG) tube (7/17; 41%) and gastritis (4/17; 24%). Other findings included oesophagitis in two patients, gastric ulcer in one patient and duodenal ulcer in one patient. One patient had extensive gastric ischaemia associated with ulceration and necrosis.

Endoscopic findings were deemed clinically significant in seven patients (37%). Commencement of treatment with a proton-pump inhibitor was recommended in two patients, and follow-up endoscopy was recommended in two patients. Two patients who were already on proton-pump inhibitors before admission had haemorrhagic gastritis, and continuation of acid suppression (either proton pump-inhibitor or H<sub>2</sub> antagonist) was recommended. Finally, in the patient with extensive gastric ischaemia, active intensive care treatment was withdrawn as a result of the endoscopy findings.

One patient had hypotension and bradycardia during endoscope insertion necessitating atropine administration. No other complications were reported.

### Relationship of endoscopic findings to patient characteristics

In this series, there was only one reported normal endoscopy. We were therefore unable to statistically assess the association between patient characteristics and abnormal endoscopic findings. Analysis of the predefined subgroup of patients with clinically significant UGI abnormalities, prompting treatment recommendations, showed no significant association with age greater than 65 years (odds ratio [OR], 2.7; 95% CI, 0.2–22.0), antiplatelet or anticoagulant medication use (OR, 0.2; 95% CI, 0.0–5.3), or clinical severity score (APACHE II score  $\geq$  20 — OR, 1.2; 95% CI, 0.1–15.3; SOFA score  $>$  11 — OR, 0.8; 95% CI, 0.1–10.6).

### Discussion

We investigated the prevalence and clinical significance of new endoscopic findings during endoscopic insertion of postpyloric feeding tubes in intensive care patients. In our study, abnormal endoscopic findings were present in most patients. Erosions from a NG tube and gastritis were the most common abnormal findings, and clinically significant findings that influenced ICU management were found in more than a third of patients. Risk factors for UGI abnormalities were also commonly present. Endoscopic postpyloric tube placement was successful in all cases.

Our findings are consistent with current literature. A recent series of UGI endoscopy found that surgical ICU patients are prone to having coincidental abnormalities of the digestive tract.<sup>12</sup> The high number of patients with new UGI abnormalities in our series may be related to the high illness severity scores in our cohort. Higher illness severity is more likely to be associated with impaired gastric emptying, necessitating the insertion of postpyloric feeding tubes, as well as with UGI abnormalities.<sup>4</sup> Stress-related mucosal injury and abnormal UGI endoscopic findings are common in critically ill patients.<sup>13</sup>

The clinical significance of gastritis in critically ill patients is unclear. Its pathophysiology likely includes gastrointestinal mucosal hypoperfusion secondary to alterations in splanchnic blood flow, which is of prognostic significance, but lacks any proven treatment strategies.<sup>14</sup> Other possible contributing factors include bile acid reflux and reperfusion injury.<sup>15</sup> The significance of the direct effects of NG tube trauma and the role of *Helicobacter pylori* have not yet been well defined.<sup>13,16,17</sup>

Stress ulcer bleeding, particularly with haemodynamic compromise, increases mortality risk in intensive care patients.<sup>18</sup> The prevalence of significant stress ulcer bleeding has been reported as 1.5% to 8% in intensive care patients, and possibly as high as 15% in the absence of stress ulcer prophylaxis.<sup>17</sup> The pathophysiological changes

outlined in the previous paragraph appear to render UGI tract mucosal surfaces more vulnerable to the effects of low intragastric pH.<sup>19</sup> Coagulopathy and respiratory failure requiring mechanical ventilation increase the risk of stress ulcer bleeding and clinically significant haemorrhage.<sup>16,18</sup> Enteral feeding reduces this risk.<sup>1</sup>

Postpyloric feeding also reduces the incidence of gastro-oesophageal regurgitation and pulmonary microaspiration.<sup>20</sup> Current evidence remains conflicting as to whether postpyloric feeding reduces the risk of aspiration pneumonia or mortality.<sup>21</sup> However, early use of postpyloric feeding instead of gastric feeding in critically ill adult patients with no evidence of impaired gastric emptying is not associated with significant clinical benefits.<sup>22</sup> Routine insertion of postpyloric feeding tubes is therefore not warranted.

Our study has several limitations: the retrospective observational nature of the study and the relatively low number of patients who underwent a UGI endoscopy for placement of a postpyloric feeding tube over the predefined time frame. In addition, our definition for clinically significant UGI abnormalities was arbitrary and based on recommendations made by the endoscopist. There is recognised uncertainty regarding the clinical and prognostic meaning of UGI abnormalities in critically ill patients, as discussed earlier.

In conclusion, our study confirms that endoscopic postpyloric feeding tube placement is safe and characterised by a high success rate. Previously undiagnosed UGI abnormalities were present in most of the intensive care patients in our series.

### Competing interests

None declared.

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