

## POINT-OF-CARE GASTRIC ULTRASOUND ASSESSMENT GUIDING SAFE ANESTHESIA IN A PATIENT ON PROLONGED ORAL SEMAGLUTIDE USE: A CASE REPORT

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### ABSTRACT

Glucagon-Like Peptide-1 Receptor Agonists (GLP-1 RAs), such as semaglutide, delay gastric emptying and may increase the risk of pulmonary aspiration during general anesthesia. We report the application of point-of-care gastric ultrasound (POCUS-G) to stratify this risk in a chronic user of oral semaglutide. Case report: A 40-year-old woman, ASA II, with persistent post-gestational diabetes mellitus, on oral semaglutide 7 mg/day for 12 months (discontinuation advised 15 days prior to surgery). A 12-hour fasting period was confirmed. POCUS-G revealed an antral cross-sectional area of 5.81 cm<sup>2</sup> in the supine position and 4.94 cm<sup>2</sup> in the right lateral decubitus position; estimated gastric volume was 49 mL (0.72 mL/kg), below the high-risk threshold of 1.5 mL/kg. General anesthesia with a modified rapid sequence induction was performed uneventfully. POCUS-G enabled safe anesthetic management and avoided surgical cancellation. This technique supports individualized decision-making in patients using GLP-1 RAs.

**Keywords:** Glucagon-like peptide-1 receptor agonists, Ultrasonography, Gastric emptying, Respiratory aspiration, Anesthesia.

### INTRODUCTION

Bronchopleural Pulmonary aspiration of gastric contents remains one of the most feared complications of general anesthesia. It occurs in approximately 1 in every 2,000–3,000 procedures and may evolve with high mortality, particularly if it results in chemical pneumonitis or ARDS.<sup>1</sup>

Glucagon-like peptide-1 receptor agonists (GLP-1 RAs), especially semaglutide, have transformed the management of type 2 diabetes and obesity: in addition to improving glycemic control and reducing cardiovascular events, they delay gastric emptying by increasing pyloric tone and modulating vagal activity.<sup>2</sup> Since their introduction in 2017 (weekly subcutaneous) and 2019 (oral formulation), semaglutide has maintained this profile owing to its high receptor affinity and long plasma half-life. Studies have shown that this delayed emptying may persist even after prolonged fasting, which explains recent

reports of intraoperative aspiration events in patients using the drug.<sup>3</sup>

In this context, gastric point-of-care ultrasound (POCUS-G) has gained importance as a rapid screening tool for residual gastric volume and has been incorporated into guidelines that also recommend withholding GLP-1 RAs in symptomatic patients or those with recent dose escalation.<sup>4</sup> The present case report aims to describe the application of POCUS-G in the preoperative evaluation of a patient on chronic semaglutide therapy, highlighting its usefulness in stratifying aspiration risk and guiding safe anesthetic management.

## CASE REPORT

A 40-year-old female patient, weighing 68 kg and measuring 1.65 m (BMI 24.98 kg/m<sup>2</sup>), classified as ASA II, with type 2 diabetes mellitus treated for twelve months with oral semaglutide 7 mg, which had been discontinued 18 days prior to undergoing abdominoplasty combined with medium-volume liposuction. Her history also included a small anterior cerebral aneurysm without clinical repercussions, in addition to chronic use of pitavastatin 2 mg and topical minoxidil. She denied allergies, smoking, or illicit drug use and had an estimated functional capacity between four and seven METs. A fasting period of twelve hours for solids and liquids was observed.

In the operating room, gastric POCUS was performed, showing an antral cross-sectional area of 5.81 cm<sup>2</sup> in the supine position and 4.94 cm<sup>2</sup> in the right lateral decubitus (Figure 1), corresponding to an estimated residual gastric volume of 49 mL (0.72 mL·kg<sup>-1</sup>), below the risk threshold for aspiration, allowing the procedure to continue with a modified rapid-sequence induction. Multiparametric monitoring was established, including noninvasive blood pressure, ECG, SpO<sub>2</sub>, Conox®, esophageal temperature, urine output, and capnography after intubation, along with intravenous access via the left upper limb using a 20 G catheter connected to two infusors.

Subsequently, during thoracic surgery, a thoracostomy was performed at the level of the left fourth intercostal space, followed by the insertion of a small-caliber chest drain. At the end of the procedure, neuromuscular blockade reversal was achieved with the administration of 200 mg of sugammadex. The patient was then extubated and transferred to the post-anesthesia care unit, where she remained for approximately 60 minutes. After reaching the maximum score (10) on the Aldrete and Kroulik scale, she was transferred to a hospital room.

Two months after the initial surgical procedure, a follow-up bronchoscopy was performed, confirming complete closure of the bronchopleural fistula (BPF).

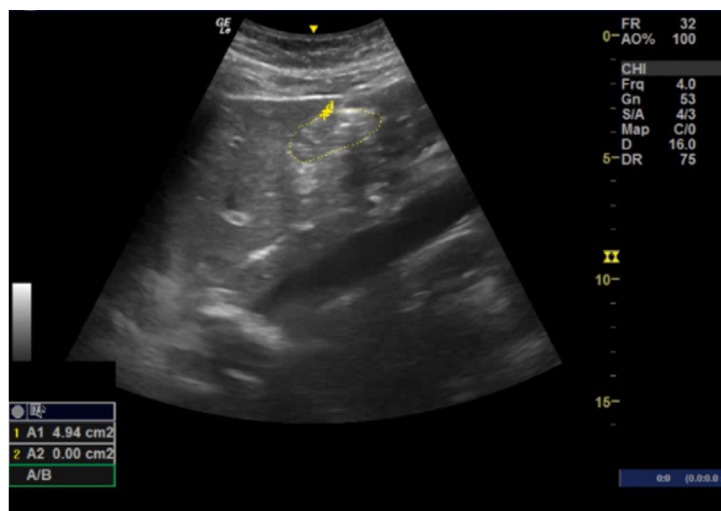


Figure 1 . Ultrasonographic image of the gastric antrum showing an area of 4.94 cm<sup>2</sup> with the patient in the right lateral decubitus position.

After premedication with midazolam 5 mg, a thoracic epidural block at T6–T7 was attempted using an 18 G Tuohy needle with the Dogliotti technique; however, blood reflux was observed after the injection of 3 mL of lidocaine, leading to abortion of the procedure. This was followed by preoxygenation with 100% oxygen for three minutes and intravenous induction with sufentanil 20 µg, target-controlled infusion of propofol (Ce 4 µg·mL<sup>-1</sup>), and cisatracurium 0.15 mg·kg<sup>-1</sup>. Direct laryngoscopy revealed a Cormack-Lehane grade I view, allowing tracheal intubation with a cuffed 7.5 mm endotracheal tube. Ventilation was set to volume-controlled mode with a tidal volume of 400 mL, respiratory rate of 12 bpm, PEEP of 5 cmH<sub>2</sub>O, and FiO<sub>2</sub> of 0.5.

Anesthesia was maintained with multimodal TIVA: propofol TCI (Ce 3–4 µg·mL<sup>-1</sup>, approximate infusion 9 mL·h<sup>-1</sup>), dexmedetomidine at 0.5 µg·kg<sup>-1</sup>·h<sup>-1</sup>, ketamine at 0.3 mg·kg<sup>-1</sup>·h<sup>-1</sup>, additional sufentanil to a total of 30 µg, and an extra dose of cisatracurium 10 mg. As prophylaxis and adjuvants, the following were administered: cefazolin 2 g before incision (repeated with 1 g after three hours), dexamethasone 10 mg, dipyron 4 g (fractionated), ondansetron 8 mg, parecoxib 40 mg, pantoprazole 40 mg, methadone 10 mg, haloperidol 2 mg, tranexamic acid 1 g, and boluses of aramina as required. Eye protection and careful padding of plexuses, joints, and bony prominences were applied. Fluid management included 250 mL of 0.9% saline solution and 3 L of Ringer's lactate.

The surgical procedure lasted approximately 95 minutes, proceeding with hemodynamic stability, blood loss below 150 mL, and adequate urine output. At the end, the patient was extubated under deep anesthesia with Conox® around 60, maintained on oxygen at 5 L·min<sup>-1</sup> via facemask, and transferred to the post-anesthesia care unit, where she achieved an Aldrete and Kroulic score of 10 within fifteen minutes, reporting pain at 2/10 and no nausea. After twelve hours of observation, she tolerated oral intake, maintained target blood glucose levels, and was discharged without complications.

This case demonstrates that, even after prolonged discontinuation of semaglutide, delayed gastric emptying remains uncertain, with gastric ultrasound serving as a valuable tool to confirm an empty stomach and to allow a safe modified rapid-sequence induction. Although the epidural

attempt was unsuccessful, multimodal analgesia with dexmedetomidine, ketamine, and methadone provided effective postoperative comfort, enabling early discharge following medium-complexity plastic surgery.

## DISCUSSION

BPF Since Mendelson's classic description, it has been established that the severity of pulmonary aspiration depends on two central factors: gastric pH  $< 2.5$  and aspirated volume  $> 0.3 \text{ mL}\cdot\text{kg}^{-1}$  ( $\approx 25 \text{ mL}$  in adults), parameters that amplify the chemical-inflammatory alveolar injury.<sup>4</sup> Acidic contents precipitate epithelial apoptosis, generate reactive oxygen species, and activate NF- $\kappa$ B, a cascade that may culminate in acute respiratory distress syndrome (ARDS) if the proinflammatory response is not interrupted<sup>5</sup>. Protective ventilation safeguards the remaining parenchyma, but mortality in contemporary series still exceeds 40%.<sup>6</sup>

GLP-1 receptor agonists, particularly semaglutide, exacerbate this risk by delaying gastric emptying. The drug activates vagal afferents in the dorsal medulla and, through central GABA release, reduces sympathetic drive while increasing pyloric tone; in parallel, it inhibits interstitial cells of Cajal, reducing slow-wave activity and antral peristalsis<sup>7</sup>. Electrogastrography after 12 weeks of use demonstrates bradygastria and increased frequency of dysrhythmias.<sup>8</sup> Pharmacokinetically, semaglutide has an oral bioavailability of only 0.4–1%, but its prolonged half-life ( $\approx 168 \text{ h}$ ), sustained by strong albumin binding, maintains therapeutic concentrations across several dosing intervals after discontinuation. This explains reports of a still-full stomach 7–10 days after the last dose and supports the recommendation to withhold the drug for at least one week before elective surgery<sup>9</sup>. Although partial tachyphylaxis of delayed gastric emptying occurs after 20 weeks, clinically relevant slowing persists, particularly in obese patients or those with other causes of gastroparesis<sup>10</sup>. Gastric emptying scintigraphy shows that the time required for 50% of ingested radioactive material to leave the stomach, known as gastric emptying half-time ( $T_{50}$ ), remains prolonged in more than 30% of individuals four weeks after discontinuation, suggesting remodeling of myoenteric motor neurons or adaptive resistance to motilin<sup>11</sup>. Gastric POCUS has emerged as a quantification tool: a meta-analysis of 1,200 patients demonstrated 95% sensitivity and 90% specificity for identifying high-risk stomachs ( $\geq 1.5 \text{ mL}\cdot\text{kg}^{-1}$  or the presence of solids)<sup>12</sup>. However, BMI  $> 40 \text{ kg}\cdot\text{m}^{-2}$ , late pregnancy, and bariatric surgery impair acoustic windows, requiring experienced operators. Novices need 24–33 examinations to achieve 90% agreement with experts, and the average acquisition time stabilizes at  $< 60 \text{ s}$  after 40 scans<sup>13</sup>. Although scintigraphy remains the gold standard for  $T_{50}$  ( $\approx 105 \text{ min}$  for half the meal), its cost, radiation exposure, and need for prolonged fasting limit routine use; agreement between gastric POCUS and scintigraphy is excellent for liquids, but diverges for fiber-rich solids.<sup>14</sup>

Based on these data, perioperative management can follow a pragmatic algorithm: discontinue GLP-1 RAs seven days before elective surgery in patients on weekly regimens or after recent dose escalation, according to ASA guidelines<sup>15</sup> and multisociety consensus<sup>16</sup>; perform gastric POCUS and proceed if the estimated volume is  $< 1.5 \text{ mL}\cdot\text{kg}^{-1}$ , given its high discriminatory power<sup>12</sup>; in cases of elevated volume or solids, consider postponing the procedure, inserting a nasogastric tube before induction, or administering erythromycin  $3 \text{ mg}\cdot\text{kg}^{-1}$  IV as a prokinetic agent<sup>17</sup>; conduct rapid-sequence induction with rocuronium  $1.2 \text{ mg}\cdot\text{kg}^{-1}$  while keeping sugammadex available<sup>18</sup>; prefer a definitive airway, although second-generation laryngeal masks are acceptable for short surgeries under endoscopic supervision, as they do not increase aspiration rates compared with endotracheal tubes (RR 0.96)<sup>19</sup>; and restart GLP-

1 RA therapy only after resumption of diet and ambulation, to avoid late hypoglycemia.<sup>20</sup>

Significant gaps remain, including defining the kinetics of return to baseline  $T_{50}$  by serial scintigraphy in different metabolic profiles; developing predictive models that combine clinical variables, gastric POCUS, and pharmacokinetics through machine learning to anticipate volumes greater than 0.8 mL·kg<sup>-1</sup> with an AUC above 0.9; clarifying interactions between semaglutide, opioids, anticholinergics, and NK1 receptor antagonists; conducting randomized trials comparing treatment continuation versus discontinuation with respect to glycemic control, respiratory complications, and length of hospital stay; and validating serum biomarkers such as motilin, peptide YY, and GLP-2 as rapid indicators of residual gastric emptying.<sup>21</sup>

## CONCLUSION

The risk of pulmonary aspiration in patients using semaglutide arises from complex neurohormonal mechanisms that prolong gastric emptying time even after discontinuation of the drug. The combination of objective stratification through gastric POCUS, selective discontinuation of the medication, prokinetic measures, and advanced airway protection techniques represents the most robust strategy currently available, but significant gaps remain and should guide future investigations.

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