

# Gastric Regurgitation During Induction of Anesthesia Due to Inadequate Drainage of the Nasogastric Tube: A Case Analysis

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## ABSTRACT

A 44-year-old man with intestinal obstruction two days for 2 days was sent to the operating room for emergency abdominal dissection. He enters the OR with a nasogastric tube (NGT), and gastric contents were visible in the gastric drainage bag. After an uneventful anesthesia induction and successful intubation, there were three unexpected gastric regurgitations encountered. Through suction from the nasogastric tube were employed immediately after the first regurgitation. A blockage in the NGT 5 cm from its tip was noticed after NGT was pulled out of the esophageal. This case shows us that the presence of a gastric tube drainage does not mean that the risk of gastric contents Regurgitatio during induction of anesthesia is reduced. Poor gastric tube drainage, blockage, etc. may not only not reduce the risk of Regurgitatio but may even give the medical staff the illusion that the stomach has emptied, thus increasing the risk. The risk of gastric Regurgitatio can be more accurately assessed by confirming the emptying level of the stomach through ultrasound.

**Abbreviations:** NGT: Nasogastric Tube; VCV: Volume-Controlled Ventilation; FOB: Fiberoptic Bronchoscopy; ARDS: Acute Respiratory Distress Syndrome

## Case Presentation

A 44-year-old man with multiple electrical burns (II-III°, 85%) 25 days and intestinal obstruction two days was admitted to the operating room for emergency abdominal dissection. He presented with persistent abdominal distention and abdominal pain without stools or farts. His abdomen was slightly distended with mild tenderness, no significant retching pain, and active bowel sounds. Both plain abdominal films with contrast and enhanced CT showed marked dilatation of the small intestine. The patient entered the operating room with a nasogastric tube, and about 200-300 ml of yellowish-brown fluid was visible in the gastric drainage bag. He normally communicated with consciousness. Arterial blood pressure 130/70 mmHg, the heart rate 101 beats per minute, and the oxygen saturation 99% while the patient was breathing ambient air. The anesthesia induction was uneventfully followed by video-laryngoscope-assisted successful intubation. Just after the tracheal-tube-cuff was inflated (the tube wasn't fixed yet), a large

amount of coffee-like stomach contents was gushed from the mouth and nose. An immediate suction was onset, and then the laryngeal was flushed with saline. He was ventilated well with an anesthesia machine by volume-controlled ventilation (VCV) method (VT= 8ml/kg, Ppeak=15 cm H2O), and there was no obvious change in airway pressure. After opening the abdominal cavity, the surgeon confirmed the small intestine ileal torsion and found the stomach to be full. Only an extract of 150 ml of stomach contents was suctioned from the nasogastric tube before it was impossible to continue suctioning, no matter how to adjust the position (depth and angle) of the nasogastric tube. In contrast, the stomach was still round and inflated. Injections with air or liquid from the Nasogastric tube were very difficult. The blockage of the nasogastric tube was verified when it was removed. No regurgitant was found in tracheal and bronchus except segments from end-tracheal-cuff to under-vocal-cords of the trachea with the inspection of Fiberoptic Bronchoscopy (FOB). He was transferred to the ICU at the end of the surgery and was extubated one day later, presenting no Pulmonary complications.

## Discussion

Regurgitation and aspiration are serious complications in the perioperative period. The use of anesthetics may result in decreased esophageal sphincter pressure, reduced level of consciousness, and decreased protective reflexes [1]. Pre-oxygenation via positive pressure ventilation by mask may lead to gastric dilatation and increased intragastric pressure, which increases the risk of Regurgitatio and aspiration. The severity of the pulmonary syndrome depends on the acidity, the volume of the aspirate and the presence of particulate matter in the aspirate. Pulmonary syndrome also varies in severity from mild symptoms such as hypoxia to complete respiratory failure and acute respiratory distress syndrome (ARDS), and even cardiopulmonary failure and death. [1]

Typically, patients undergoing emergency surgery should be considered satiated and should be treated with caution. A nasogastric tube is often used to reduce gastric pressure and drain gastric contents. Although there are reports that have not confirmed the effectiveness of this method, in some patients, even placement of a nasogastric tube may lead to vomiting and subsequent aspiration by mistake [1]. In this particular patient, the patient entered the operating room with a nasogastric tube and a gastric drainage bag containing approximately 200-300 ml of fluid, so we neglected to use ultrasound to assess gastric contents prior to induction of anesthesia. In this case, the Regurgitatio occurred after the tracheal tube cuff was inflated, the fluid was promptly aspirated, the airway was immediately secured, and an appropriate extubation was performed. This patient was fortunate to have no pulmonary complications. The presence of satiety during emergency surgery, elevated intragastric pressure due to intestinal obstruction, and positive pressure ventilation during induction of anesthesia in this patient are all high-risk factors for the development of Regurgitatio aspiration [2], which should be our primary concern. Ultrasound of the gastric sinus region allows for adequate assessment of gastric contents and contributes to safer clinical management of patients at increased risk for pulmonary aspiration during airway management [3]. One study suggests that preoperative ultrasound assessment of gastric contents should be performed in all emergency patients and in elective patients in whom predictors of satiety have been identified [4]. The current study suggests that bedside ultrasound assessment of the gastric sinus and body can provide reliable qualitative and quantitative information about gastric contents [5]. This patient had incomplete preoperative gastrointestinal decompression and was not effectively evaluated, so very severe Regurgitatio occurred during the perianesthesia period.

In patients with intestinal obstruction, whatever the cause, it eventually leads to gastric distention, causing increased intragastric pressure, gastroesophageal Regurgitatio and vomiting [6]. It is important to know the patient's pre-infarction feeding and drainage to assess the degree of drainage patency. The positioning of the nasogastric tube can help us to assess the patency of drainage from the nasogastric tube. Reviews have shown that the best method for

locating the nasogastric tube in terms of sensitivity and specificity is ultrasound, followed by external magnetic guidance, electromagnetic methods and finally capillography/capillary imaging [7]. In this case, we did not notice the above before induction and neglected to assess satiation; satiation was not detected until intraoperatively. All types of enteral feeding tubes can become occluded, with the fine-bore tubes being at particular risk [8]. Blockage of the nasogastric tube is an easily underestimated complication and is particularly common when thicker enteral feeds, bulking agents and medications are delivered through relatively small nasogastric tubes [9]. Many case reports have shown that excessively long cannulae tend to lead to nasogastric tube kinking [10-12]. Prevention is a key factor in the treatment of nasogastric tube blockage. It should be flushed with at least 30 ml of sterile water every 4 hours or before and after tube feeding [13]. When a patient is found to have poor drainage and nasogastric tube occlusion does occur, the nasogastric tube should first be flushed with sterile water to keep it open [13]. However, in such cases, the nasogastric tube cannot be unblocked by various methods and the blockage can be resolved by replacing it with a larger caliber nasogastric tube.

However, only nasogastric tubes of the same caliber were available at that time, which resulted in the nasogastric tube being blocked again. When a patient experiences Regurgitatio, we should immediately tilt the patient's head to the side and place them in a head-down position to avoid aspiration. A study has shown that immediate suctioning and rinsing with saline to thoroughly clean the mouth, nose and throat during induction of general anesthesia, in combination with Sellick position and head-down tilt, has the potential to prevent pulmonary aspiration[14]. In the present case, the patient regurgitated a large amount of gastric contents after induction. However, due to timely intubation and inflation of the tracheal catheter-cuff and timely cleaning of the mouth and nose, only a small amount of gastric contents was found in the airway above the tracheal catheter-cuff during FOB examination, which was very effective in avoiding aspiration by mistake. When the patient was transferred to the ICU for postoperative treatment, the trachea above the cuff was repeatedly flushed before the tracheal tube was removed, which was very effective in avoiding pulmonary complications, and there were no inflammatory infections, hypoxemia, or other related pulmonary complications at follow-up.

## Conclusion

The efficiency of gastrointestinal decompression should be adequately assessed in patients with intestinal obstruction undergoing emergency surgery, even in patients with a nasogastric tube placed; ultrasonography of the stomach is preferred. Understanding and mastering the basic skills of gastric volume assessment by ultrasonography is essential to prevent similar situations related to this case.

## Disclosure and Conflicting

All the authors (Yuan Qin, Yi-xing Xiao, Zhi-ming Zhang and Hui-Dang Ou-Yang) agreed that: There was no conflicting has to be stated.

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