Case report

Case 1

An 83-year-old female patient was admitted into isolation wards for positive SARS-CoV-2 nucleic acid detection from a throat swab sample. Before admission, she was receiving treatment for cerebral infarction sequelae in a community hospital. Nasogastric tube indwelling was essential due to cachexia and complicated underlying diseases (hypertension, cerebral infarction, hemiplegia, and senile dementia). Nevertheless, the intubation procedure was impeded not only by
noncooperation but also by age-related thoracocyllosis.

Bedside ultrasonography, performed with a portable ultrasound system (TE7, Mindray biomedical electronic Co., Ltd, Shenzhen, China), was used for tube placement guiding. After attempted insertion of a nasogastric tube for about 15 cm, cervical scanning on the left side was conducted to observe whether the tube was placed correctly in esophagus. When the location was confirmed, the intubation procedure proceeded. When the operation finished, sub-sternum scanning of stomach was performed to further ensure appropriate tip location (Fig. 1).

![Figure 1](image1.png)

**Figure 1**  In sub-sternum longitudinal plane, the parallel hyperechoic tube wall (White arrow) can be delineated nicely in esophagus and empty stomach (A), and the tip of the tube (Black arrow) is appropriately placed in the stomach (B). LL, left liver.

![Figure 2](image2.png)

**Figure 2**  In sub-sternum transversal plane, gastric wall (GW) and gastric mucosa (White arrow) can be observed clearly (A, B), and presence of air bubbles (Black arrow) after tentatively air injection confirmed the appropriated location of nasogastric tube (B). GW, gastric wall; LL, left liver.

**Case 2**

A 67-year-old female patient was admitted into isolation wards for fever and bilateral pneumonia. On March 9, she appeared to experience intermittent limb convulsion, without any symptoms of pneumonia. A computed tomography (CT) of the chest showed completely normal pulmonary. Considering her history of epilepsy secondary to cerebral infarction, emergency physician prescribed antiepileptic medicine for symptom control. Five days later, on March 14, this patient developed a fever that reached 38 °C (100.4 °F), and a new CT scan showed bilateral pulmonary consolidation and pleural effusion. In accordance with the Chinese Clinical Guidance for COVID-19 Pneumonia Diagnosis and Treatment (7th edition) [6], she was diagnosed as having suspected severe pneumonia. Similar to the prior patient, this patient also had anemia and hemiplegia caused by multiple episodes of cerebral infarction. Long-term bed rest and bone degeneration resulted in crook-like thoracic deformity, which made the placement of nasogastric tube quite difficult.

Bedside ultrasonography was performed to help guide the operation. Different from the last patient, whose stomach was well-delineated because of cachexia, this patient’s stomach cavity and nasogastric tube could not be well observed because of more distorted thorax and constipation-caused gas disturbance. Therefore, a small amount of air was tentatively injected after intubation,
while a transducer was used for real-time monitoring sub-sternum. A sign of continuous air bubble rolling indicated that the tube was located appropriately (Fig. 2).

**Discussion**

Ultrasonography-guided intervention is a feasible and effective technique. Its history can be traced back to the 1970s [7]. With advantages that include real-time visualization, multiplanar capability, portability, and radiation-free, ultrasonic guidance is now widely used in interventional operations including but not limited to tissue biopsy, minimally-invasive operation, and venous catheterization [8].

Ultrasonography guided intubation of the nasogastric tube and nasojejunal tube have also been reported [9,10]. Nasogastric tubes are commonly used in patients for gastrointestinal decompression, medicine administration, and enteral nutrition. In our two cases, both patients were elderly, long-term bedridden, had poor basic condition, and were infected with COVID-19, hence early placement of gastric tube was essential. However, complications of cerebrovascular accident (e.g., hemiplegia, aphasia) and degenerative diseases (e.g., senile dementia, thoracic deformity) made placement of the gastric tube particularly challenging. Conventional blind intubation in this case had a higher risk of misplacement into the trachea, which can result in severe consequences such as pneumonia, pneumothorax, empyema and pulmonary haemorrhage [11]. Nasogastric tubes are made primarily from flexible polyurethane and have a great acoustic impedance that is different from that of soft tissue, making the visualization of the gastric tube possible. By means of cervical esophagus scanning, ultrasonography can identify tube location in the early stages and thus instruct operation.

Furthermore, ultrasonography can also confirm tip location of the inserted tube. Studies have demonstrated good diagnostic accuracy of ultrasonography in the confirmation of appropriate tube placement [12,13]. Our observation also confirmed the effectiveness of ultrasonography both under favorable and unfavorable imaging conditions. This is especially valuable in isolation wards, where conventional confirmation methods are usually invalid. In particular, attempted gastric fluids aspiration usually yields nothing because of the impaired gastrointestinal function of severe patients. As for the auscultation method, strict protective wearing in infection wards makes it impossible to complete.

In conclusion, based on our limited observation, we believe bedside ultrasonography should play an important role in nasogastric tube placement in isolation wards as well as in auxiliary assessment.

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**Conflicts of Interest**

The authors have no conflict of interest to declare.

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