

Clinical Application of a Modified Gastric-Nasopharyngeal Suction Catheter for Continuous Supraglottic Secretion Management in an Older Patient With Silent Aspiration: A Case Report

Xiaoyu Zhang

Guangdong Provincial Hospital of Chinese Medicine

Zhenzhen Liu

Guangdong Provincial Hospital of Chinese Medicine

Zhiwei Nie

Guangdong Provincial Hospital of Chinese Medicine

Caiping Liu

Guangdong Provincial Hospital of Chinese Medicine

Huimin He

Guangdong Provincial Hospital of Chinese Medicine

Ming Yang

Guangdong Provincial Hospital of Chinese Medicine

Juan Liu

liujuan0906@163.com

Guangdong Provincial Hospital of Chinese Medicine

Case Report

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Abstract

Silent aspiration of oropharyngeal secretions is difficult to manage in older adults with cognitive impairment and may contribute to persistent pulmonary infection. A 93-year-old Han Chinese man with mild cognitive impairment developed persistent remittent fever and copious sputum despite 11 days of intensified broad-spectrum antibiotic therapy and frequent passive suctioning. Fiberoptic endoscopic evaluation of swallowing demonstrated severe pooling of saliva in the valleculae and bilateral pyriform sinuses with silent aspiration. Following multidisciplinary assessment, a modified gastric-nasopharyngeal suction catheter was used to provide continuous low-negative-pressure supraglottic secretion drainage while preserving enteral feeding through the main lumen. Body temperature normalized within 24 hours, sputum volume fell from 50-80 mL/day to less than 10 mL/day, and suctioning frequency decreased from 24-30 times/day to no routine suctioning. Procalcitonin and high-sensitivity C-reactive protein subsequently decreased. On Days 21 and 22, temporary occlusion of the suction lumen was accompanied by recurrent fever and increased sputum; clinical stability returned after catheter patency was restored. The catheter remained in place for 34 days without documented mucosal injury. No catheter-related adverse events were observed during the observation period. This case suggests that continuous supraglottic secretion drainage may represent a feasible adjunctive approach for selected non-ventilated patients with persistent silent aspiration.

Clinical trial registration

Not applicable (single case report).

Key Clinical Message

In an older non-ventilated patient with cognitive impairment and severe silent aspiration, continuous supraglottic secretion drainage through a modified gastric-nasopharyngeal catheter was temporally associated with reduced sputum burden and clinical stabilization. This minimally invasive adjunct may represent an option for selected patients with persistent silent aspiration when conventional aspiration-management strategies are insufficient.

1. Introduction

Cognitive impairment is a progressive clinical syndrome associated with substantial functional decline and a growing global health burden. Dementia, in particular, remains a leading cause of disability worldwide, with the number of affected individuals projected to rise substantially in the coming decades due to population ageing [1]. Mild cognitive impairment (MCI), considered an intermediate state between normal cognitive ageing and dementia, is associated with an increased risk of progression to dementia and represents an important stage for early intervention and prevention strategies [2].

Swallowing dysfunction is increasingly recognized as a common and clinically significant complication among older adults with cognitive impairment and dementia. Previous studies have reported that

dysphagia affects a substantial proportion of individuals with cognitive decline, with reported prevalence ranging from approximately 38% to 63% depending on disease severity, diagnostic methods, and study populations [3, 4]. The pathophysiology of dysphagia in cognitive impairment is complex and involves impaired oral motor control, delayed swallowing initiation, pharyngeal residue accumulation, reduced laryngeal sensation, and impaired airway-protective responses [5]. Importantly, swallowing safety is not determined solely by brainstem-mediated reflex pathways but also depends on cortical regulation, attention, and executive function, which are frequently impaired in patients with cognitive decline [6].

Silent aspiration, defined as the entry of saliva, food, or liquid into the airway without an effective cough response or other overt clinical signs, is particularly challenging to identify and manage in cognitively impaired patients [4]. Because protective symptoms may be absent, aspiration events can remain undetected and contribute to recurrent respiratory infections, aspiration pneumonia, prolonged hospitalization, and deterioration in functional status [4,6,15]. In patients with MCI or dementia, impaired awareness, reduced ability to follow swallowing strategies, decreased alertness, and limited participation in rehabilitation may further increase aspiration risk.

Current management strategies for dysphagia and aspiration prevention include compensatory postural techniques, dietary texture modification, swallowing rehabilitation, oral hygiene interventions, and intermittent oropharyngeal suctioning [7–9]. Although these approaches can reduce selected aspiration risks, they may not completely address the continuous accumulation and downward migration of oropharyngeal secretions, particularly during sleep or periods of reduced consciousness. The International Dysphagia Diet Standardisation Initiative (IDDSI) framework has improved the standardization of food and fluid modification strategies; however, dietary modification primarily targets bolus aspiration and cannot eliminate aspiration caused by endogenous saliva secretion [9].

Continuous drainage of subglottic secretions through specialized endotracheal tubes or tracheostomy systems has been investigated mainly in mechanically ventilated patients and has demonstrated potential benefits in reducing aspiration-related complications in intensive care settings [10, 11]. However, these approaches require an artificial airway and are unsuitable for non-ventilated patients who remain at risk of persistent silent aspiration. Therefore, there remains a clinical need for less invasive strategies capable of continuously reducing supraglottic secretion burden in selected non-ventilated patients.

Here, we report the application of a modified gastric-nasopharyngeal suction catheter (GNSC) in a 93-year-old non-ventilated patient with mild cognitive impairment, severe silent aspiration, and persistent pulmonary infection despite conventional treatment. The device is a dual-lumen modification of a standard gastric tube that enables continuous low-negative-pressure drainage of supraglottic secretions while maintaining enteral feeding access. This report describes the clinical rationale, treatment course, safety observations, and an unplanned interruption–rechallenge-like observation (i.e., temporary catheter occlusion followed by recurrence of symptoms and subsequent improvement after patency restoration).

2. Case Presentation

2.1 Ethics and consent

The Institutional Ethics Committee of Guangdong Provincial Hospital of Chinese Medicine waived the requirement for formal ethics approval for this single case report. Written informed consent for publication of the patient's clinical information and images was obtained from the patient's legally authorized representative (a family member), because the patient lacked decision-making capacity owing to cognitive impairment. A copy of the written consent form is available for review by the Editor-in-Chief of this journal. The report was prepared in accordance with the CARE guideline for clinical case reporting ^[12].

2.2 Patient information and baseline status

A 93-year-old Han Chinese man was admitted to the Department of Geriatrics on October 15, 2025, with a 3-day history of sudden right-sided limb weakness and difficulty speaking. He was conscious and alert on arrival but had dysarthria, recent-memory impairment (he could not recall what he had eaten for breakfast), and temporal disorientation (he could not state the current year or month). Right-sided limb muscle strength was grade 4/5 (Medical Research Council scale). His cough reflex was diminished, sputum was viscous, and body temperature was 38.5°C.

His medical history included hypertension for 20 years, treated with amlodipine, and hyperlipidemia for 10 years, treated with atorvastatin. There was no history of diabetes mellitus, coronary heart disease, or a previous diagnosis of dementia.

The admission diagnoses were: (1) cerebral infarction involving the left basal ganglia (recovery phase); (2) mild cognitive impairment (MCI), diagnosed according to Petersen criteria ^[2]; (3) community-acquired pneumonia; and (4) grade 3 hypertension. The family reported memory decline during the preceding 2 years, objective cognitive impairment was confirmed on formal assessment, basic activities of daily living were essentially preserved, and dementia criteria were not met.

Cognitive assessment within 48 hours of admission showed a Mini-Mental State Examination (MMSE) score of 18/30 (education-adjusted cutoff, 24), a Montreal Cognitive Assessment (MoCA) score of 16/30 (cutoff, 17), and an Activities of Daily Living (Barthel Index) score of 15/100, indicating severe dependence (lower scores reflect greater disability). The patient had completed junior high school and had worked as an accountant.

2.3 Clinical deterioration despite conventional treatment

After admission, the patient received antiplatelet therapy, lipid-lowering treatment, antihypertensive therapy, and empirical intravenous ceftriaxone (2 g once daily). Clinical deterioration became evident on October 25.

Chest computed tomography (CT) on October 28 showed progression of bilateral pulmonary consolidation, new involvement of the right middle lobe, and increased bilateral pleural effusions. High-

sensitivity C-reactive protein (hs-CRP) increased from 45 to 185 mg/L, and procalcitonin (PCT) increased from 0.8 to 2.8 ng/mL. Serial inflammatory markers are summarized in Table 1.

Table 1
Inflammatory markers during the clinical course

Parameter (reference range)	Oct 15	Oct 28	Nov 5 (Pre-GNSC)	Nov 11 (Day 5)	Dec 10 (Discharge)
WBC, ×10 ⁹ /L (3.5–9.5)	9.8	12.5	11.8	7.2	6.5
Neutrophils, % (40–75)	82	89	87	72	58
hs-CRP, mg/L (< 10)	45	185	156	28	12
PCT, ng/mL (< 0.05)	0.8	2.8	2.1	0.45	0.04

An interim laboratory check on December 9 (day 33) showed a transient procalcitonin of 0.17 ng/mL and neutrophils of 15.1% without corresponding clinical signs; these values are not displayed in the above columns.

WBC, white blood cell count; hs-CRP, high-sensitivity C-reactive protein; PCT, procalcitonin; GNSC, gastric-nasopharyngeal suction catheter.

On October 25, antibiotic therapy was escalated to intravenous piperacillin-tazobactam (4.5 g every 8 hours). Intravenous immunoglobulin (10 g daily for 3 days) and human albumin were also administered. Oropharyngeal and nasopharyngeal suctioning was performed 21–27 times/day and subsequently increased as the sputum burden worsened.

After 11 days of intensified treatment, remittent fever persisted, with daily peaks of 38.8–39.5°C and a highest recorded temperature of 40.3°C on October 28. Sputum remained yellow-green and viscous at approximately 50–80 mL/day, and passive suctioning was required 24–30 times/day. Repeat chest CT on October 30 showed persistent consolidation and a new right pleural effusion.

2.4 Multidisciplinary evaluation and identification of silent aspiration

A multidisciplinary team (MDT) consultation was convened on November 5, with input from clinical pharmacy, respiratory medicine, clinical nutrition, speech-language pathology, rehabilitation medicine, radiology, and nursing. The team reassessed potential contributors to persistent fever and the ongoing pulmonary process.

Drug fever was considered unlikely because withholding pantoprazole and ambroxol from October 30 to November 2 did not reduce the temperature. Lower-extremity ultrasonography on November 3 showed no deep-vein thrombosis; D-dimer was mildly elevated at 1.2 mg/L in the setting of active infection. Adrenal insufficiency was considered unlikely because cortisol rhythm testing on November 3 was within

the clinical reference assessment used by the treating team (08:00, 185 nmol/L; 16:00, 95 nmol/L). Blood and urine cultures obtained on November 4 were negative, and peripheral intravenous sites showed no erythema. T-SPOT.TB, G-test, and GM-test results were negative.

Fiberoptic endoscopic evaluation of swallowing (FEES), performed by a speech-language pathologist, demonstrated massive pooling of saliva in the valleculae and bilateral pyriform sinuses (> 50% residue), delayed swallowing initiation (> 3 s), and trace clear secretions passing through the laryngeal inlet during swallow despite preserved glottic closure. The water swallow test was grade 4, with multiple swallows and coughing. These findings supported severe dysphagia with silent aspiration.

The MDT considered ongoing aspiration of oropharyngeal secretions to be a major contributor to the persistent pulmonary infection. Because high-frequency intermittent suctioning did not prevent ongoing secretion accumulation and aspiration, the team elected to trial continuous low-negative-pressure supraglottic secretion drainage.

2.5 Catheter design and insertion

The nursing team worked with biomedical engineering staff to prepare a modified gastric-nasopharyngeal suction catheter (GNSC). The device used a 14Fr silicone nasogastric tube (120 cm long) as the main lumen and an external medical-grade polyvinyl chloride suction lumen thermally fused along the tube. The main lumen (3.0 mm inner diameter) retained the functions of enteral feeding and gastric decompression. The suction lumen (0.8 mm inner diameter) contained four multidirectional side holes (1.0 mm diameter, 2.0 cm spacing) located 15–21 cm from the catheter tip, with the intention that the suction openings would lie at the supraglottic level when the gastric tip was correctly positioned. The structure of the modified gastric-nasopharyngeal suction catheter (GNSC) is shown in Fig. 1.

The modified catheter was assembled in-hospital by the nursing and biomedical engineering teams and sterilized according to standard hospital sterilization protocols before clinical use.

Continuous negative pressure was set at -5 to -8 kPa. The clinical team selected this range with reference to prior airway-suction literature and calibrated the system before use with a digital pressure gauge (accuracy ± 0.1 kPa) ^[13]. Pressure and catheter patency were checked during nursing handovers.

Continuous negative pressure was delivered through the hospital standard wall-mounted suction system. Catheter patency was maintained by routine saline flushing; no dedicated anti-occlusion coating was applied.

The catheter was inserted through the right nostril on November 6 (Day 0) to a depth of 55 cm. Bedside radiography confirmed the distal tip in the gastric antrum and the suction side holes estimated to be at approximately the C4-C5 level. Enteral nutrition was simultaneously delivered through the main lumen (enteral nutrition emulsion, 500 mL/day; pump rate, 50 mL/h over 10 hours).

2.6 Clinical course and follow-up

The clinical course from admission to discharge is summarized in Table 2.

Table 2
Clinical timeline from admission to discharge

Date	Course	Key event	Clinical manifestation	Intervention	Primary outcome
Oct 15–22	Admission	Baseline establishment	Right limb weakness, dysarthria, cognitive decline, T 38.5°C	Standard therapy	Baseline established
Oct 25–Nov 4	Deterioration	CT: expanded consolidation; PCT 2.8 ng/mL; peak T 40.3°C	Persistent remittent fever, viscous sputum	Antibiotic escalation, IVIG, albumin	Treatment ineffective
Nov 5	Pre-MDT	MDT consultation; FEES: severe silent aspiration	Persistent fever, sputum 50–80 mL/day, suction 24–30 times/day	Decision to use GNSC	Alternative etiologies assessed
Nov 6 (Day 0)	GNSC insertion	Catheter inserted; suction – 5 to -8 kPa + enteral feeding	Immediate sputum reduction; yellow-green to white foamy	Continuous suction initiated	Procedure uneventful
Nov 6 (+ 6 h)	Post-insertion	Suction 2 times (white foam, small volume)	T 37.8°C	Maintenance	Temperature trending down
Nov 7 (+ 1 d)	First day	Temperature normalized	T 36.4°C	Maintenance	Normothermia within 24 h
Nov 8 (+ 2 d)	Stabilization	Suction 0–1 time/shift; sputum < 10 mL/day	White foamy sputum	Maintenance	Marked sputum reduction
Nov 11 (+ 5 d)	Laboratory recheck	PCT 0.45 ng/mL; neutrophils 72%	General improvement	Maintenance	Inflammatory markers declining
Nov 15 (+ 9 d)	Stabilization	Sleep improvement (5-h continuous nighttime sleep)	Improved behavioral compliance	Maintenance	Family-reported improvement
Nov 20 (+ 14 d)	Midpoint	Suction 0 times/shift; follows simple commands	Minimal sputum	Maintenance	Neurobehavioral improvement observed

Date	Course	Key event	Clinical manifestation	Intervention	Primary outcome
Nov 6–26 (Days 0–20)	Sustained stability	Continuous normothermia (36.2–36.8°C)	No sputum rebound	Continuous suction	PCT decreased from 0.45 ng/mL (Day 5) to 0.03–0.05 ng/mL by Day 20
Nov 27 (+ 21 d)	Catheter occlusion	Suction lumen occluded; sputum increased	T 38.2°C	10 mL saline flush; suction restored	Normothermia within 2 h
Nov 28 (+ 22 d)	Re-occlusion	Repeat occlusion	T 38.7°C; yellow viscous sputum ~ 20 mL	Repeat flush; pressure adjusted to -6 kPa	Normothermia within 24 h
Dec 1 (+ 25 d)	FEES recheck	Vallecular residue < 10%; increased suprahyoid elevation	Compensatory swallowing improvement	Maintenance	Objective improvement documented
Dec 5 (+ 29 d)	Stabilization	Regular sleep-wake cycle (6–7 h nighttime sleep, daytime alertness)	Sustained neurobehavioral improvement	Maintenance	Stable
Dec 9 (+ 33 d)	Laboratory fluctuation	PCT transiently 0.17 ng/mL; neutrophils 15.1%	No symptoms; sputum unchanged	Observation	No corresponding clinical infection features
Dec 10 (+ 34 d)	End of observation	Suction 0 times/day; improved cooperation	Good general condition	GNSC removed; 16 Fr standard gastric tube placed	Transfer to rehabilitation facility

GNSC, gastric-nasopharyngeal suction catheter; MDT, multidisciplinary team; PCT, procalcitonin; FEES, fiberoptic endoscopic evaluation of swallowing; IVIG, intravenous immunoglobulin.

The patient's temperature decreased to 37.8°C within 6 hours of catheter insertion and reached 36.4°C on the morning of November 7, after 11 days of persistent fever. Sputum changed from yellow-green and viscous to white and foamy, and the daily volume fell from approximately 50–80 mL to less than 10 mL. The need for passive sputum suctioning decreased from 24–30 times/day to 0–1 time/shift and then to none. PCT decreased from 2.1 ng/mL on November 5 to 0.45 ng/mL on November 11, while hs-CRP decreased from 156 mg/L before GNSC placement to 12 mg/L by December 10. The temporal changes in body temperature and sputum suction frequency are shown in Fig. 2.

On Days 21 and 22 (November 27–28), the suction lumen became temporarily occluded. On both occasions, fever recurred (38.2°C and 38.7°C), yellow viscous sputum reappeared, and passive suctioning was again required. Saline flushing restored catheter patency; after the second event, suction pressure was adjusted to -6 kPa. Normothermia returned within 2 hours after the first episode and within 24 hours after the second. This unplanned interruption–rechallenge sequence constituted an interruption–rechallenge-like observation but cannot establish causality in a single patient.

The GNSC remained in place for 34 consecutive days, from November 6 to December 10. Daily nursing assessment documented intact nasal mucosa without congestion, erosion, or bleeding. No nasal pressure injury, catheter-related bleeding, clinically recognized airway mucosal injury, or gastroesophageal reflux during feeding was recorded; gastric residual volumes remained below 100 mL. However, systematic endoscopic mucosal surveillance was not performed, and the patient's cognitive impairment limited reliable self-reporting of discomfort.

Repeat FEES on December 1 (Day 25) showed a reduction in vallecular residue from more than 50% to less than 10%, with improved suprahyoid elevation and laryngeal excursion. During the observation period, the patient's sleep-wake pattern also became more regular, with 6–7 hours of continuous nighttime sleep and improved daytime alertness. Nursing staff and family members noted improved cooperation and response to simple verbal instructions. These behavioral observations were descriptive; they were not interpreted as evidence of cognitive recovery because no discharge MMSE or MoCA assessment was available.

On December 10, the GNSC was removed and replaced with a 16 Fr standard gastric tube, and the patient was transferred to a rehabilitation facility in good general condition.

2.7 Patient and family perspective

Owing to the patient's cognitive impairment, a directly patient-authored perspective could not be obtained. The patient's family reported that they were reassured by the resolution of fever and the marked reduction in sputum, and that communication with the patient became easier as his sleep-wake pattern normalized. The family supported publication of this case in the hope that it would help clinicians manage similar patients with persistent silent aspiration.

3. Discussion

This case provides a proof-of-concept observation that continuous supraglottic secretion management using a dual-lumen catheter is feasible in a non-ventilated older patient with mild cognitive impairment, severe silent aspiration, and persistent pulmonary infection despite conventional treatment.

First, clinical improvement was observed shortly after initiation of continuous low-negative-pressure drainage, following 11 days of persistent fever despite broad-spectrum antibiotics and frequent conventional suctioning. The temporal sequence of events—including initiation of continuous suction, sustained normothermia, temporary catheter occlusion, recurrence of fever, restoration of catheter

patency, and subsequent clinical improvement—is illustrated schematically in Fig. 2. Although temperature values between key time points were not continuously recorded and the figure represents a schematic trend rather than complete daily measurements, this within-patient interruption–rechallenge sequence provides stronger observational support than a simple before-and-after comparison^[14]. Nevertheless, the observed association should be interpreted cautiously because concurrent antibiotic therapy, supportive care, and natural disease fluctuation may also have contributed to recovery.

Second, this case highlights a potential conceptual shift from intermittent secretion removal to continuous secretion management. Conventional oropharyngeal suctioning removes secretions after accumulation but does not continuously interrupt the movement of saliva toward the laryngeal inlet and subglottic space. In this patient, fiberoptic endoscopic evaluation of swallowing (FEES) demonstrated substantial pharyngeal pooling and silent entry of secretions into the airway, supporting the rationale for targeting the supraglottic secretion reservoir. By maintaining continuous low-negative-pressure drainage, the gastric-nasopharyngeal suction catheter (GNSC) may reduce the burden of secretions available for aspiration. This concept is analogous to subglottic secretion drainage strategies used in mechanically ventilated patients^[10, 11], although the anatomical approach and patient population differ substantially.

An important potential advantage of this approach is that it does not require active patient participation. Swallowing rehabilitation, postural strategies, and dietary modification remain essential components of dysphagia management^[7–9]; however, their effectiveness may be limited in cognitively impaired individuals who have reduced ability to participate consistently in training or follow safety instructions. The GNSC is not intended to replace established dysphagia interventions but may serve as an adjunctive strategy for selected patients with persistent silent aspiration and a high supraglottic secretion burden despite conventional management.

Third, no clinically apparent nasal or airway mucosal injury was documented during 34 days of catheter use; however, tolerability could not be formally assessed because the patient had cognitive impairment and systematic endoscopic surveillance was not performed. The negative pressure applied in this case (– 5 to – 8 kPa) was selected conservatively and remained below previously reported levels associated with mucosal injury in experimental studies^[13]. However, a single case cannot establish safety. Potential complications of continuous suction include mucosal trauma, bleeding, discomfort, pressure-related injury, secretion blockage, catheter displacement, and possible effects on swallowing physiology. The two observed catheter occlusion episodes further emphasize the need for standardized protocols regarding catheter positioning, monitoring, flushing, and occlusion management in future studies.

The observed improvement in sleep–wake patterns and behavioral cooperation is clinically interesting but should be interpreted cautiously. These changes may have resulted from improvement of infection, reduced need for frequent suctioning, better sleep quality, rehabilitation, environmental factors, or other aspects of supportive care. Because standardized post-intervention cognitive assessments were unavailable, no conclusion regarding cognitive improvement can be made.

Several limitations should be acknowledged. First, this was a single case without a control group, and causal inference cannot be established. Second, multiple treatments were administered simultaneously, including antimicrobial therapy and supportive interventions. Third, temperature data between major clinical events were not available for every time point and should therefore be interpreted as a schematic representation rather than direct continuous measurements. Fourth, inflammatory cytokines such as IL-6 and TNF- α were not evaluated, and the proposed pathway linking secretion reduction to systemic inflammatory improvement remains hypothetical. Fifth, post-discharge follow-up and repeat standardized cognitive assessments were unavailable. Finally, the GNSC used in this case was a locally modified device, and its optimal design, pressure parameters, maintenance procedures, regulatory considerations, and generalizability require further investigation. Furthermore, no standardized swallowing assessment scale (e.g., Penetration–Aspiration Scale or Dynamic Swallowing Score) was used to quantify pre- and post-intervention swallowing safety, and systematic endoscopic surveillance of the airway was not performed. As a locally modified device, the GNSC also entails regulatory and generalizability constraints beyond those of a single-center, single-case report.

From a broader clinical perspective, the GNSC approach represents a potential strategy for managing aspiration-related complications in frail older patients who are not candidates for artificial airways. By utilizing an existing enteral-access route, this approach may avoid the additional invasiveness associated with endotracheal intubation or tracheostomy. Future prospective feasibility studies should evaluate objective aspiration outcomes, FEES-based measurements, secretion burden, inflammatory markers, adverse events, and comparative effectiveness against standard care.

In summary, this case describes the clinical application of a gastric-nasopharyngeal suction catheter in a non-ventilated patient with cognitive impairment, severe silent aspiration, and refractory pulmonary infection. The temporal association between continuous supraglottic drainage and clinical improvement, together with the observed interruption–rechallenge pattern after catheter interruption, provides a rationale for further investigation. These findings should be regarded as hypothesis-generating rather than evidence of efficacy, and controlled prospective studies are needed to determine the safety, feasibility, and clinical value of this approach in broader populations with dysphagia and silent aspiration.

4. Conclusion

In this older non-ventilated patient with cognitive impairment and severe silent aspiration, use of a modified gastric-nasopharyngeal suction catheter for continuous supraglottic secretion drainage was temporally associated with rapid clinical stabilization and a marked reduction in sputum burden and passive suctioning requirements. The observation supports further investigation of continuous supraglottic drainage as a potential adjunctive strategy for selected patients with persistent aspiration-related pulmonary complications. Efficacy and safety cannot be established from a single case and require prospective controlled evaluation.

Abbreviations

CT

computed tomography

ADL

Activities of Daily Living

FEES

Fiberoptic Endoscopic Evaluation of Swallowing

GNSC

gastric-nasopharyngeal suction catheter

hs-CRP

high-sensitivity C-reactive protein

IVIG

intravenous immunoglobulin

MCI

mild cognitive impairment

MDT

multidisciplinary team

MMSE

Mini-Mental State Examination

MoCA

Montreal Cognitive Assessment

PCT

procalcitonin

PVC

polyvinyl chloride

WBC

white blood cell count.

Declarations

Ethics approval and consent to participate

The Institutional Ethics Committee of Guangdong Provincial Hospital of Chinese Medicine waived the requirement for formal ethics approval for this single case report. The patient's legally authorized representative provided written informed consent for the patient's participation in this case report, because the patient lacked decision-making capacity owing to cognitive impairment.

Consent for publication

Written informed consent for publication of this case report and any accompanying images was obtained from the patient's legally authorized representative (a family member), because the patient

lacked decision-making capacity owing to cognitive impairment. The representative consented to the publication of his clinical details and images under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence, so that these data may be freely accessible on the internet. A copy of the written consent form is available for review by the Editor-in-Chief of this journal on request.

Availability of data and materials

De-identified data supporting this report are available from the corresponding author on reasonable request. Original video and imaging data are not publicly shared because of patient privacy considerations.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Xiaoyu Zhang: case observation, data collection, and drafting of the manuscript.

Zhenzhen Liu: catheter design, technical implementation, and device parameter calibration.

Zhiwei Nie: multidisciplinary coordination, speech-language pathology assessment, and critical revision of the manuscript.

Caiping Liu: nursing data collection and daily assessment documentation.

Huimin He: nursing data collection and daily assessment documentation.

Ming Yang: study design, supervision, and manuscript revision.

Juan Liu: study design, ethics application, funding acquisition, and final approval of the manuscript.

All authors have read and approved the final manuscript.

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Figures

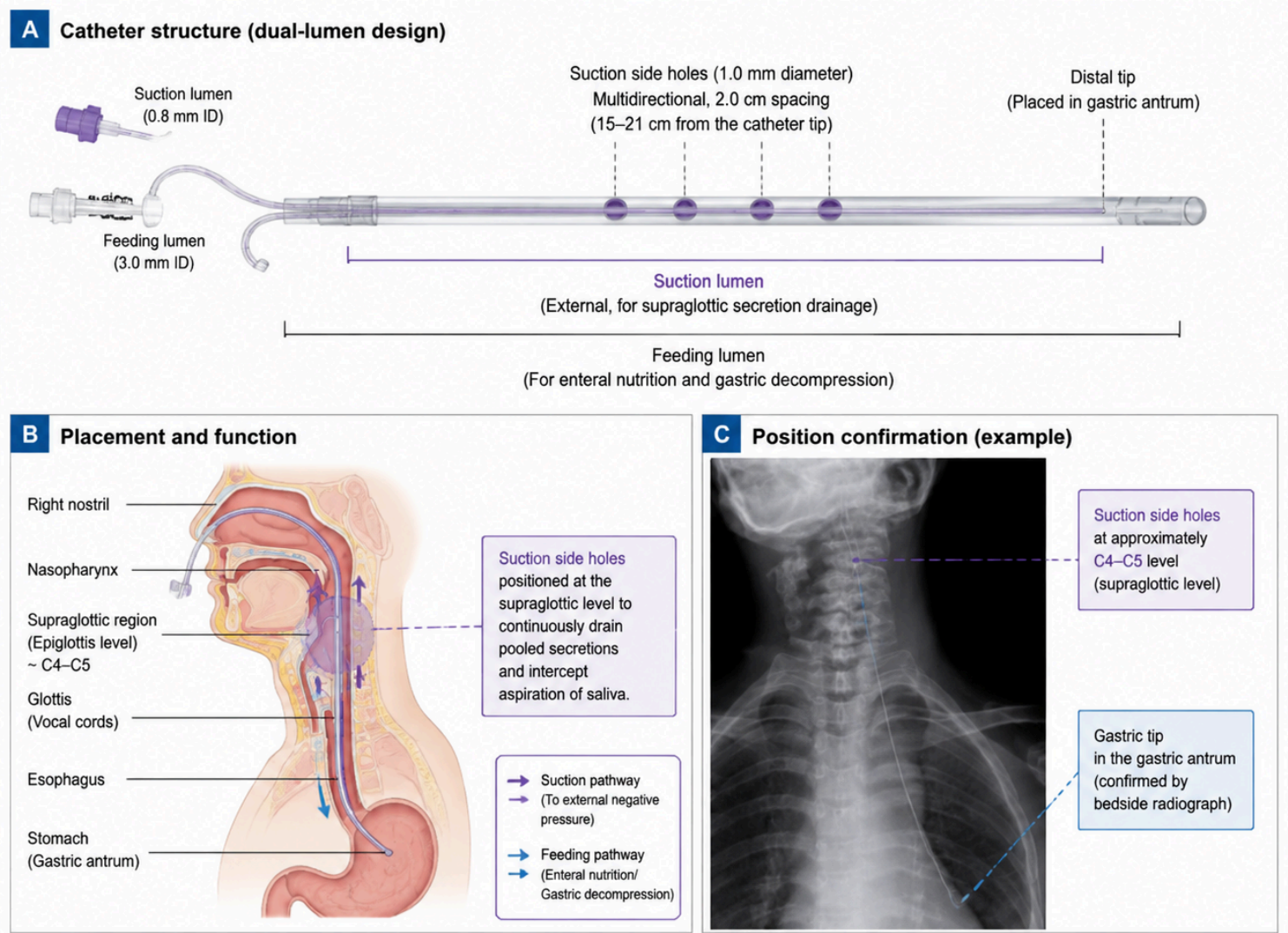


Figure 1

Schematic illustration of the gastric-nasopharyngeal suction catheter (GNSC). (A) Dual-lumen integrated design: main lumen for enteral feeding (3.0 mm inner diameter) and external suction lumen (0.8 mm inner diameter) with four multidirectional side holes (1.0 mm diameter, 2.0 cm spacing). (B) Lateral view showing intended side-hole positioning at the epiglottis-soft palate level (approximately C4–C5, 12–14 cm from the nares). The side holes are located 15–21 cm from the catheter tip, corresponding to approximately 12–14 cm from the nares when the tip is positioned in the gastric antrum. (C) Bedside radiograph (anteroposterior view) confirming the catheter tip in the gastric antrum and the suction side holes at the supraglottic level.

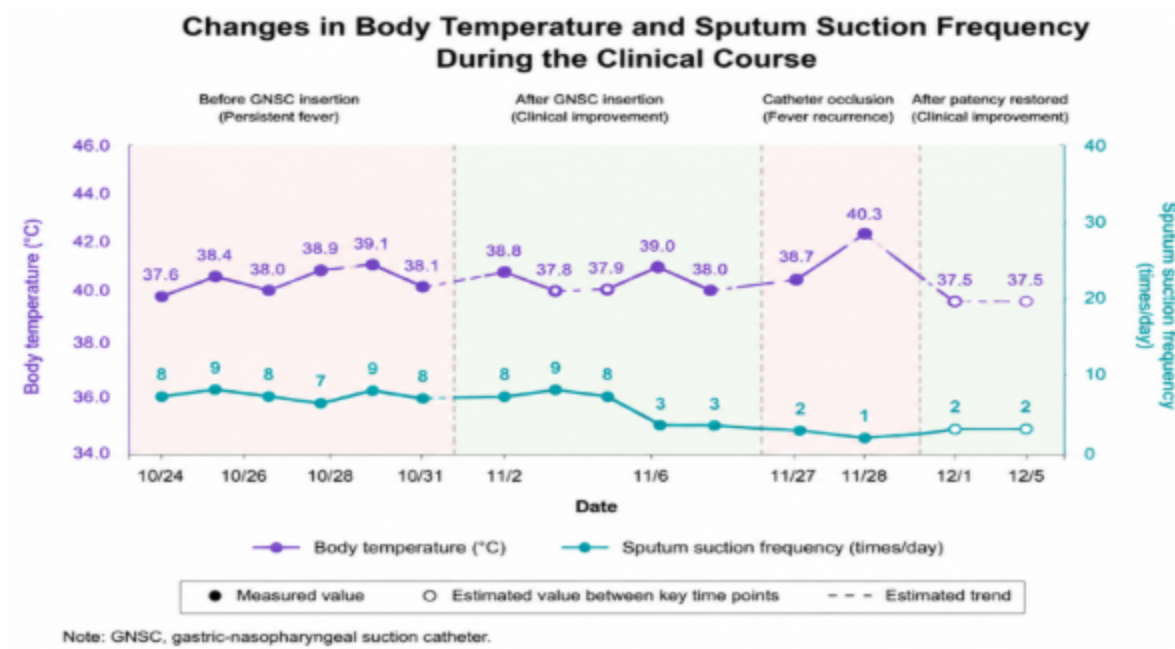


Figure 2

Changes in body temperature and sputum suction frequency during the clinical course. Solid circles represent measured peak daily temperatures; open circles indicate estimated values between key time points. The purple line represents body temperature (°C), and the blue line represents sputum suction frequency (times/day). Dashed trend lines indicate inferred trends. The horizontal dashed line at 38.0 °C marks the fever threshold. The vertical dashed line on November 6 indicates GNSC insertion. The two vertical arrows (November 27 and 28) mark inadvertent catheter occlusion events. The shaded area represents the period of sustained normothermia after GNSC insertion. GNSC, gastric-nasopharyngeal suction catheter.

Supplementary Files

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