Pharyngeal Electrical Stimulation for Severe Dysphagia After Subarachnoid Hemorrhage: A Case Report

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Abstract

Background

Severe dysphagia is a common and devastating sequela of hemorrhagic stroke, particularly following subarachnoid hemorrhage (SAH). Conventional swallowing therapies are often insufficient in patients with severe neurogenic dysphagia complicating complex neurocritical illness. Pharyngeal electrical stimulation (PES) using the Phagenyx® system is a United States Food and Drug Administration (US-FDA)-cleared neurostimulatory intervention for severe post-stroke dysphagia that leverages cortical neuroplasticity to restore swallowing function.

Case Presentation

A 30-year-old woman presented with acute diffuse SAH, left hemisphere infarction, and severe dysphagia requiring mechanical ventilation and nasogastric tube feeding. Following a complex neurocritical care course including decompressive hemicraniectomy, multiple endovascular procedures, and ventriculoperitoneal shunt placement, she received six consecutive daily sessions of PES beginning on hospital day 21.

Results

Pre-PES assessment demonstrated a Functional Oral Intake Scale (FOIS) score of 1 (nothing by mouth), Murray Secretion Severity Rating of 0 (normal), and Penetration Aspiration Scale (PAS) score of 8 (silent aspiration) for thin liquids. Following six PES sessions, fiberoptic endoscopic evaluation of swallowing (FEES) revealed improvement in swallowing function; the patient was able to progress to a dysphagia diet (FOIS 5), with PAS scores of 1–2 across consistency levels. Percutaneous endoscopic gastrostomy tube placement was avoided, re-intubation was unnecessary, and the patient was discharged to inpatient rehabilitation on hospital day 28.

Conclusions

This case supports the use of extended 6-session PES protocols in complex neurocritical care patients and contributes real-world evidence for PES efficacy in severe post-hemorrhagic stroke dysphagia.

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Introduction

Dysphagia is among the most common and functionally disabling consequences of acute stroke, with reported incidence as high as 80% and prevalence of 10–40% in stroke survivors.[1–3] In high-grade aneurysmal SAH, the severity of associated dysphagia is compounded by altered consciousness, aspiration pneumonitis, prolonged intubation, and multisystem critical illness. Patients who require nasogastric tube (NGT) or nasojejunal tube (NJT) feeding during the acute phase often progress to percutaneous endoscopic gastrostomy (PEG) tube insertion, at significant cost and quality-of-life impact.[4]

Traditional dysphagia management in the acute setting relies on diet texture modification, compensatory strategies, and exercises. The 2022 United States-Food and Drug Administration (US-FDA) clearance of the Phagenyx® pharyngeal electrical stimulation (PES) catheter as a de novo device for treatment of severe post-stroke dysphagia introduced a novel neurostimulatory modality leveraging sensorimotor cortical plasticity to drive swallowing recovery.[5,6] PES is delivered via a specialized nasogastric-inserted catheter with embedded pharyngeal electrodes positioned at the level of the pharyngeal plexus; the device simultaneously functions as a standard feeding tube.

Clinical trials have demonstrated PES efficacy in tracheotomized stroke patients, facilitating earlier decannulation, improved swallowing function on validated dysphagia scales, and reduced feeding tube dependence.[7–10] An extended 6-session protocol, beyond the 3-session cycle, has been employed by experienced US Phagenyx® centers for severe post-stroke dysphagia.[5] Herein, we present a case report of a 30-year-old woman with severe SAH who received an extended PES protocol, ultimately avoiding PEG placement and achieving safe oral intake by discharge.

Case Report

A 30-year-old woman presented to the emergency department following sudden onset of altered mental status and expressive aphasia while at work. Her last known well was approximately eight hours before arrival. She was found unresponsive on the floor by coworkers. On initial evaluation, the National Institutes of Health Stroke Scale (NIHSS) was 2 for mixed aphasia; blood pressure was 100 mm Hg systolic. Initial computed tomography (CT) head was without acute hemorrhage; CT perfusion (CTP) suggested bilateral middle cerebral artery (MCA)-anterior cerebral artery (ACA) watershed ischemia. She subsequently developed seizures, and repeat CT head revealed left suprasellar subarachnoid hemorrhage (SAH) with intraventricular hemorrhage (IVH) involving the left hemisphere with hydrocephalus. CT angiography (CTA) identified a left ophthalmic segment dissecting aneurysm and left MCA bifurcation blister aneurysm. The patient was

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intubated for airway protection and underwent emergent external ventricular drain (EVD) placement.

Complex Neurocritical Care Course. Within hours of ICU admission, the patient suffered aneurysm re-rupture, with CT head demonstrating worsening SAH with intracranial pressure (ICP) crisis exceeding 50 mm Hg. Digital subtraction angiography (DSA)-guided pipeline embolization device (PED) stenting of the left internal carotid artery (ICA) was performed; subsequently, a new left medial temporal hematoma was identified necessitating a subsequent overlapping pipeline stent. Over the following week, ICP management required multimodal sedation, hyperosmolar therapy with 23.4% hypertonic saline, and continuous EVD drainage, with ICPs ranging 14–28 mm Hg.

A repeat DSA performed roughly one week into the admission showed no vasospasm but interval evolution of the left ICA communicating segment aneurysm. CTP and CTA obtained several days later demonstrated diffuse spasm, prompting urgent repeat angiography, at which point the left ICA stent was found occluded. Recanalization was achieved with intra-arterial tissue plasminogen activator (tPA), balloon angioplasty, and stent retriever assistance, though diffuse vasospasm persisted. The patient developed left MCA territory infarction with cerebral edema and midline shift; by hospital day 11, a left decompressive hemicraniectomy was performed.

Concurrent systemic complications included ventilator-associated methicillin-sensitive staphylococcus aureus (MSSA) pneumonitis requiring sequential antibiotic courses, bilateral pleural effusions with dense consolidations on CT chest, and neurogenic stunned myocardium with echocardiographic ejection fraction (EF) of 46% on admission which recovered to normal function within the first two weeks of hospitalization. An occlusive right distal brachial vein thrombosis was managed conservatively with sequential compression devices and subcutaneous heparin, given the prohibitive intracranial hemorrhage risk. Persistent shivering and agitation required dexmedetomidine, meperidine, buspirone, and ultimately sertraline and trazodone.

The patient was successfully extubated on hospital day 16, placed on high-flow nasal cannula, and subsequently weaned to room air with oxygen saturation 100%. Severe dysphagia persisted throughout, and she remained nasogastic tube (NGT) dependent on Peptamen AF at 65–75 mL/hour, with dysphagia having been documented as a concurrent diagnosis since admission. The EVD was clamped and subsequently removed approximately three weeks into the admission; however, the patient developed progressive hydrocephalus, necessitating elective right frontal ventriculoperitoneal shunt placement (hospital day 24), set at a Strata Snap pressure of 2.0, with postoperative imaging confirming improved hydrocephalus.

Swallowing Assessment and Decision for PES Treatment. Following extubation and a period of neurological stabilization spanning approximately five days, a speech language pathologist (SLP) was engaged. By hospital

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day 21, fiberoptic endoscopic evaluation of swallowing (FEES) demonstrated severe dysphagia with profound oropharyngeal dysfunction. The patient's pre-PES assessment revealed a Functional Oral Intake Scale (FOIS) score of 1 (nothing by mouth), a Murray Secretion Severity Rating of 0 (normal), and a Penetration Aspiration Score (PAS) of 8 (silent aspiration) for thin liquids. The patient was fully NGT-dependent for nutrition.

Given the severity of dysphagia and the high risk for PEG progression, the neurocritical care team — in coordination with the SLP — elected to initiate an extended 6-session PES protocol using Phagenyx®. Written informed consent was obtained from the patient's legally authorized representative.

PES Procedure and Treatment Protocol. On hospital day 21, the Phagenyx® catheter was inserted by the neurocritical care advanced practice provider. The catheter was measured from the nasal tip to the earlobe to the xiphoid process, advanced to 65 cm, and placement was confirmed by plain abdominal radiograph demonstrating correct gastric positioning. A nasal bridle was applied to secure the catheter in place. The procedure was tolerated on the first attempt without complications.

PES stimulation was delivered once daily for six consecutive days at 5 Hz frequency for 10 minutes per session, with intensity calibrated to 75% of the maximal tolerated intensity (MTI) each session, consistent with established PES protocols.[5–8] All sessions were well tolerated without adverse events. Table 1 summarizes the treatment log; Table 2 summarizes clinical outcomes across the hospitalization.

Clinical Outcomes. Following completion of the 6-session PES protocol, FEES was performed on hospital day 27. FEES revealed improvement in swallowing function, with the patient able to progress to a dysphagia diet across multiple consistency levels. Key outcome findings are summarized in Table 2.

Primary Outcomes. The FOIS trajectory was the most striking change observed across the treatment course. Prior to PES initiation, the patient had a FOIS score of 1, reflecting complete nil-per-os (NPO) status and full dependence on nasojejunal tube feeding. By the time of her FEES assessment one day after the final PES session, she had advanced to FOIS 5, reflecting the ability to consume a multi-consistency dysphagia diet with compensatory strategies. Importantly, PEG tube placement was avoided entirely, and the NGT was removed prior to discharge.

The patient's PAS on FEES demonstrated improvement across all bolus consistencies tested. The most clinically significant change was observed for thin liquids, where PAS decreased from 8 (silent aspiration) to 2 (penetration above the vocal folds with material ejected). Mildly thick liquids improved from PAS 8 to PAS 1. Puree and solid consistencies, which carried pre-PES PAS scores of 4 and 1 respectively, both normalized to PAS 1 on FEES. This pattern of consistency-dependent improvement is consistent with the established neurophysiological mechanism of PES-mediated cortical reorganization of the swallowing motor program.

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Table 1. Pharyngeal Electrical Stimulation Session Log — Phagenyx® Treatment Protocol

Session	Day	Intensity	Duration	Clinical Notes
1	21	75% MTI	10 min	Catheter inserted under fluoroscopy; procedure tolerated without complications. Baseline: FOIS 1, Murray 0, PAS 8 (thin liquid).
2	22	75% MTI	10 min	Eyes open spontaneously; following commands with left upper extremity. Improved alertness noted.
3	23	75% MTI	10 min	Neurologically stable. NJT feeds continued. SLP monitoring ongoing.
4	24	75% MTI	10 min	VP shunt placed same day. PES continued per protocol. NGT temporarily held during operative period.
5	25	75% MTI	10 min	Post-operative Day 1 VPS. Neurologically stable. PES well tolerated. Afebrile.
6	26	75% MTI	10 min	Final session. FEES planned following day. SpO_2 100% room air. Tube feeds held in anticipation.

Note: MTI = Maximal tolerated intensity; FOIS = Functional Oral Intake Scale; Murray = Murray Secretion Severity Rating; PAS = Penetration Aspiration Scale; NJT = nasojejunal tube; SLP = speech and language pathologist; VP = ventriculoperitoneal shunt; PES = pharyngeal electrical stimulation; SpO_2 = oxygen saturation.

Table 2. Swallowing and Neurological Outcome Measures — Admission Through Discharge

Measure	Admission	Pre-PES Day 21	Post-PES FEES Day 27
Functional Oral Intake Scale	1	1	5
Murray Secretion Severity	N/A (intubated)	0 (Normal)	0 (Normal)
PAS – Thin Liquid	N/A (intubated)	8 (Silent Asp.)	2 (Penetration, ejected)
PAS – Mildly Thick	N/A	8	1 (Normal)
PAS – Puree	N/A	4	1 (Normal)
PAS – Solid	N/A	1	1 (Normal)
Diet	NPO / Intubated	NPO / NGT	Dysphagia Diet
Airway	Intubated	Extubated	Room Air
Nutrition Route	NGT Peptamen AF	NGT / NJT	PO + NGT

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Note: PES = Pharyngeal electrical stimulation; PAS = Penetration Aspiration Score.

Re-intubation did not occur at any point during the post-extubation course, and no new aspiration pneumonia events were documented following PES initiation. The patient was discharged to inpatient rehabilitation on hospital day 28, tolerating a dysphagia diet orally and breathing comfortably on room air.

Discussion

This case demonstrates clinically significant improvement in swallowing function following a 6-session PES protocol in a young patient with catastrophic hemorrhagic stroke and multisystem critical illness. The complexity of this case — encompassing SAH with IVH, delayed cerebral ischemia, left MCA territory infarction, prolonged mechanical ventilation, MSSA pneumonia, decompressive hemicraniectomy, and VP shunting — represents a substantially more complex clinical backdrop than is typically described in published PES clinical trials.

Several landmark studies provide important context for interpreting these outcomes. The PHAST-TRAC trial demonstrated a 49% vs. 9% decannulation readiness rate in tracheotomized stroke patients (OR=7.0, p=0.0008),[8] establishing PES as a clinically meaningful intervention for patients with severe post-stroke dysphagia. The PHADER registry subsequently extended these findings, showing FOIS improvement of 2.9 points and PAS reduction of 4.1 points at 3 months across a broad population of neurogenic dysphagia patients,[9] including those with hemorrhagic stroke and traumatic brain injury. More recently, a randomized controlled pilot trial demonstrated FOIS of 4.1 vs. 2.1 at Day 3 ($p<0.0005$), earlier resumption of oral feeding (4.3 vs. 10.2 days, p=0.001), and reduced feeding tube dependence at discharge (27% vs. 53%, p=0.035) in post-extubation stroke patients treated with PES.[10] Our patient's outcomes are consistent with and extend these published findings to a more complex neurocritical care context.

Beyond the central neurological mechanism, the clinical course of this patient highlights an important and underappreciated dual-pathway rationale for PES in post-extubation dysphagia. Prolonged mechanical ventilation is associated with impaired laryngopharyngeal sensation and reduced substance P—a key neurotransmitter in swallowing reflex maintenance—at peripheral pharyngeal receptors.[5] PES, by delivering patterned electrical stimulation at the pharyngeal plexus, may simultaneously address the central cortical reorganization deficit from the SAH-related hemispheric infarction and the peripheral neurotransmitter depletion resulting from prolonged intubation. This dual-pathway effect may partly explain the substantial improvement observed in this patient despite the severity and complexity of her illness.

The use of an extended 6-session protocol reflects the evolving real-world experience at United States Phagenyx® treatment centers, as described by Torrealba-Acosta and colleagues.[5] The extension from 3 to 6 sessions is rational in patients with more severe baseline dysphagia where a single cycle may be insufficient to drive adequate

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cortical neuroplasticity. Predictors of PES success include younger age and earlier intervention,[11] both favorable in our patient (30 years; PES initiated on day 21 post-ictus). Notably, PES was safely administered concurrently with VP shunt placement without device-related complications.

Conclusions

This case report documents significant improvement in swallowing function following six sessions of Phagenyx® PES treatment in a 30-year-old woman with catastrophic SAH, left hemisphere infarction, and severe post-extubation dysphagia. Primary outcomes included FOIS improvement from 1 to 5, PAS improvement from 8 to 1–2 across consistency levels, avoidance of PEG tube placement, avoidance of re-intubation, and successful discharge to inpatient rehabilitation on hospital day 28. This case contributes real-world evidence supporting the safety and potential efficacy of extended (6-session) PES protocols in complex neurocritical care patients with severe post-hemorrhagic stroke dysphagia.

Pharyngeal Electrical Stimulation (PES) Clinical Pearls

- PES should be considered early in post-extubation severe dysphagia following hemorrhagic stroke, particularly in younger patients with supratentorial injuries. Prolonged intubation compounds dysphagia through peripheral depletion of substance P at pharyngeal receptors; PES may address both the central cortical deficit from stroke and the peripheral neurotransmitter deficit from intubation simultaneously.
- An extended 6-session PES protocol may be appropriate in complex neurocritical care patients with severe baseline dysphagia (e.g. FOIS 1, PAS 8).
- Fiberoptic endoscopic evaluation of swallowing (FEES) or videofluroscopy provides objective instrumental confirmation of swallowing improvement post-PES and should guide diet advancement decisions.
- PES can be safely administered in patients undergoing concurrent neurosurgical interventions (e.g. VP shunting) with appropriate multidisciplinary oversight.
- Avoidance of percutaneous endoscopic gastrostomy (PEG) placement, resumption of oral intake, and re-intubation represent meaningful patient-centered outcomes of PES treatment during inpatient hospital management.

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