Dysphagia therapy in tracheostomized patients requiring ventilator care: a single-center experience

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Background/Aims: Dysphagia is highly prevalent in tracheostomized patients in the intensive care unit (ICU). This study aimed to evaluate the association between a dysphagia therapy program and deglutition problem at hospital discharge in tracheostomized hospital survivors requiring mechanical ventilation (MV) for more than 14 days.

Methods: We enrolled 165 hospital survivors (69.7% male; median age 68 years) at the respiratory ICU of our institution who underwent tracheostomy and received MV more than 14 days between February 2011 and January 2021. The dysphagia therapy program consisted of suprahyoid muscle strengthening exercises, postural changes/compensatory maneuvers and neuromuscular electrical stimulation to the submental muscles administered by the physiatrists and occupational therapist. Factors predictive dysphagia status at hospital discharge were evaluated using multivariate regression analysis.

Results: Among the total patients, 100 patients (60.6%) exhibited dysphagia at hospital discharge. The dysphagia therapy program was implemented in 41 (24.8%) patients. Comparison of patients with and without dysphagia revealed that the former had a lower participation rate in dysphagia therapy program (15.0% vs 40.0% p<0.001). Patients with dysphagia at hospital discharges had significantly higher one-year cumulative mortality (58.0% vs 13.0%, p<0.001). Multivariate analysis identified two factors associated with dysphagia at hospital discharge: non-participation in a dysphagia therapy program (Odd ratio: 3.423, 95% confidence interval: 1.577-7.429, p=0.002) and age ≥ 75 years (OR: 2.837, 95% CI: 1.242-6.480, p=0.013). Furthermore, patients who underwent dysphagia therapy program had significantly lower one-year cumulative mortality (26.8% vs 45.2%, p=0.044)

Conclusions: Our study found that approximately 60% of tracheostomized patients who received MV for more than 14 days experienced dysphagia at hospital discharge. Implementation of a dysphagia therapy program was associated with a lower incidence of dysphagia at hospital discharge and lower one-year cumulative mortality.

Table 1. Clinical characteristics of total patients

	Total (n=165)
Male, n (%)	115 (69.7)
Age (years)	68 (19–93)
BMI (kg/m²)	22.0 (13.2–39.3)
MV LOS (days)	23 (14–383)
Hospital LOS (days)	48 (14–383)
APACHE II score [1]	18 (4–35)
SOFA score [1]	7 (0–14)
Charlson's comorbidity index	4 (0–11)
Comorbidities before admission	
Chronic neurologic diseases[2]	50 (30.3)
Diabetes	48 (29.1)
Cardiovascular diseases	45 (27.3)
Chronic lung diseases[3]	31 (18.8)
Hemato-oncologic diseases	21 (12.7)
Chronic kidney diseases	17 (10.3)
Chronic liver diseases	16 (9.7)
Chronic rheumatologic diseases	5 (3.0)
Dysphagia at hospital discharge	100 (60.6)
Dysphagia therapy program during hospital stay[4]	41 (24.8)
One-year cumulative mortality after ICU admission	67 (40.6)

Continuous variables are reported as median (range); and categorical variables are reported as number (%).
[1]All clinical data were calculated or obtained from medical records on the ICU admission day
[2]Included cerebrovascular accidents, intracerebral hemorrhage, subdural hemorrhage, subarachnoid hemorrhage, and Alzheimer dementia.
[3] The dysphagia therapy program consisted of suprahyoid muscle strengthening exercises, postural changes/compensatory maneuvers and neuromuscular electrical stimulation to the submental muscles administered by the physiatrists and occupational therapist.
[4]Included suprahyoid muscle strengthening exercise and postural changes/compensatory maneuvers which was applied along with neuromuscular electrical stimulation to the submental muscles by the physiatrists and occupational therapist
Abbreviations: BMI, body mass index; MV, mechanical ventilation; LOS, length of stay; APACHE II, Acute Physiology and Chronic Health Evaluation II; SOFA, Sequential Organ Failure Assessment; ICU, intensive care unit.

Table 2. Comparisons of clinical characteristics and outcome of patients with and without dysphagia at hospital discharge

	Dysphagia at hospital discharge		P-value
	Yes (n=100)	No (n=65)	
Male	68 (68.0)	47 (72.3)	0.606
Age, yr	71 (19–93)	66 (34–86)	0.019
BMI, kg/m²	21.6 (16.0–39.1)	23.1 (13.2–39.3)	0.061
MV LOS (days)	23 (14–122)	23 (14–383)	0.256
Hospital LOS (days)	33 (14–284)	63 (18–383)	<0.001
APACHE II score[1]	18 (5–35)	18 (4–35)	0.631
SOFA score[1]	7 (0–14)	6 (0–13)	0.641
Comorbidities			
Chronic neurologic diseases[2]	37 (37.0)	13 (20.0)	0.024
Diabetes	24 (24.0)	24 (24.0)	0.082
Cardiovascular diseases	33 (33.0)	12 (18.5)	0.049
Chronic lung diseases[3]	16 (16.0)	15 (23.1)	0.309
Hemato-oncologic diseases	12 (12.0)	9 (13.8)	0.812
Chronic kidney diseases	11 (11.0)	6 (9.2)	0.798
Chronic liver diseases	10 (10.0)	6 (9.2)	> 0.999
Chronic rheumatologic diseases	4 (4.0)	1 (1.5)	0.649
Dysphagia therapy program during hospital stay[4]	15 (15.0)	26 (40.0)	< 0.001
One-year cumulative mortality after endotracheal intubation	58 (58.0)	9 (13.8)	< 0.001

Continuous variables are reported as median (range); and categorical variables are reported as number (%).
[1]All clinical data were calculated or obtained from medical records on the day of ICU admission.
[2]Included cerebrovascular accidents, intracerebral hemorrhage, subdural hemorrhage, subarachnoid hemorrhage, and Alzheimer dementia.
[3] Included chronic obstructive pulmonary disease, interstitial lung disease, and destroyed lung due to various causes.
[4]The dysphagia therapy program consisted of suprahyoid muscle strengthening exercises, postural changes/compensatory maneuvers and neuromuscular electrical stimulation to the submental muscles administered by the physiatrists and occupational therapist
Abbreviations: BMI, body mass index; MV, mechanical ventilation; LOS, length of stay; APACHE II, Acute Physiology and Chronic Health Evaluation II; SOFA, Sequential Organ Failure Assessment; ICU, intensive care unit. *

Table 3. Univariate and multivariate analyses of factors associated with dysphagia at hospital discharge

Factors	Univariate analysis		Multivariate analysis	
	OR (95% CI)	p-value	OR (95% CI)	p-value
No dysphagia therapy programs during hospital stay[1]	3.778 (1.803-7.918)	<0.001	3.423 (1.577-7.429)	0.002
Age ≥ 75 years [2]	3.273 (1.528-7.011)	0.002	2.837 (1.242-6.480)	0.013
Chronic neurologic diseases as comorbidities	2.349 (1.131-4.879)	0.022		
Chronic cardiovascular diseases as comorbidities	2.175 (1.025-4.617)	0.043		

Statistical significance was determined using univariate and multivariate analysis. (Hosmer- Lemeshow chi-square = 2.479, df = 7, p = 0.929)
[1]The dysphagia therapy program consisted of suprahyoid muscle strengthening exercises, postural changes/compensatory maneuvers and neuromuscular electrical stimulation to the submental muscles administered by the physiatrists and occupational therapist
[2]The optimal cutoff value was based on the maximum Youden's index (Area under the curve: 0.608, 95% CI 0.529-0.683, p=0.015 Sensitivity 83.1% Specificity 40.0)
Abbreviations: OR, Odd ratio; CI, Confidence interval