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Article

The effect of early intervention of swallowing therapy on recovery from oropharyngeal dysphagia in stroke patients: a cross sectional study

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Abstract. *Background:* Dysphagia is a widely recorded morbidity after stroke. It is associated with respiratory complications, increased risk of aspiration pneumonia, nutritional compromise and dehydration, and detracts from quality of life. The time of initiation of rehabilitation for dysphagia in stroke patients has an important role in recovery from dysphagia and preventing its complications. Unfortunately, this time point has been highly variable. *Aim:* to investigate the effect of the onset time of swallowing therapy on improving swallowing safety, return to oral intake, and reducing aspiration pneumonia following a stroke. *Methods:* A cross sectional study of thirty-nine patients with dysphagia due to acute cortical and subcortical stroke attending dysphagia clinic in phoniatrics unit, Otorhinolaryngology (ORL) department, Alexandria main university hospital. Patients were allocated based on the time of presentation and initiation of swallowing therapy after the stroke into early initiation group (3 days after stroke); (2) intermediate group (2 weeks after stroke); and (3) late group (1-month after stroke). Patients were assessed before starting swallowing rehabilitation and at the end of the study after 2 months by fiberoptic endoscopic evaluation of swallowing, functional oral intake scale, Mann Assessment of Swallowing Ability, and chest x-ray. Patients received swallowing rehabilitation sessions 3 times per week for 2 months. Statistical analysis was carried out. *Results:* At the end of the study there was a significant difference in the swallowing function and results of the MASA ($p < 0.001$) and fiberoptic endoscopic evaluation of swallowing, before and after swallowing treatment among the 3 groups. Chi-square test showed a statistically significant difference of MASA for the risk of dysphagia and the risk for aspiration between the 3 groups after swallowing treatment. As for the early intervention group, return to oral intake were better than another group. According to FOIS,

there was a significant difference between each group before and after treatment, while there was no significant difference between the groups after treatment. Pneumonia frequency in the early group was lower than in other groups. *Conclusion***:** Our data suggest that intervention for dysphagia management at the proper time can improve swallowing safety, oral intake and reduce pulmonary complications.

Keywords: Stroke, deglutition, deglutition disorders, Pneumonia, Therapy outcome, Rehabilitation.

Introduction

Dysphagia is a disorder that affects the oral, pharyngeal, and/or esophageal swallowing processes. Oropharyngeal dysphagia is an abnormality in the upper aerodigestive tract's swallowing physiology and occurs often after stroke, with an incidence ranging from 29% to 81% (1). This discrepancy between the incidence studies depends on the different diagnostic methods, time after stroke, and lesion types. Aspiration is probably the most severe aspect of oropharyngeal dysphagia with an incidence ranging from 22% to 52% (2). Patients with dysphagia after stroke have a higher incidence of pneumonia, dehydration, malnutrition, and death than those without dysphagia.(3)

Swallowing is mediated by cortical and subcortical structures with descending input to the brainstem. Specific neural systems (sensory, motor) that cross these levels and interconnect with cortical, subcortical and brainstem regions are involved in swallowing (4).

Dysphagia assessment methods can be generally classified as imaging (Videofluoroscopic swallowing study, Fiberoptic endoscopic swallowing assessment, and Fiber-optic endoscopic swallowing evaluation with sensory testing) and non-imaging (besides evaluation instruments, and pharyngeal manometry). (5)

Dysphagia rehabilitation is comprised of both compensatory and rehabilitative approaches.(6) Compensatory strategies are used to alleviate dysphagia symptoms without changing the physiology, while rehabilitative approaches aim to improve swallowing physiology, swallow safety, and tolerance of the least restrictive diet.(7)

Compensatory approaches include enteral feeding through a nasogastric tube or by percutaneous endoscopic gastrostomy, postural changes, diet modification, and changing the size of the bolus. Rehabilitative methods include oral motor exercises; airway-protecting maneuvers, and thermal-tactile stimulation (8).

The literature concerning the onset time of swallowing rehabilitation following stroke is either highly variable or is not stated in most investigations. In some studies, interventions have been initiated as soon as 24 h after stroke (9) or within 7 days after stroke (10), or, and between 4 and 6 weeks or even 3-6 months post-stroke (11). On the other hand, some studies have only focused on early intervention and did not consider the time at which swallowing rehabilitation was initiated for optimal recovery (9, 10).

The effect of early intervention of swallowing therapy on recovery from oropharyngeal dysphagia in stroke patients

The timing of post-stroke dysphagia rehabilitation has been understudied. Thus, in this study, we have undertaken a prospective analysis of consecutive patients with a stroke presented to the swallowing clinic to investigate the effect of the onset time of swallowing therapy on functional recovery from oropharyngeal dysphagia, improving oral intake, and reducing aspiration pneumonia following a stroke.

Objective

To investigate the effect of the onset time of swallowing therapy on improving swallowing safety, improving oral intake, and reducing aspiration pneumonia following a stroke.

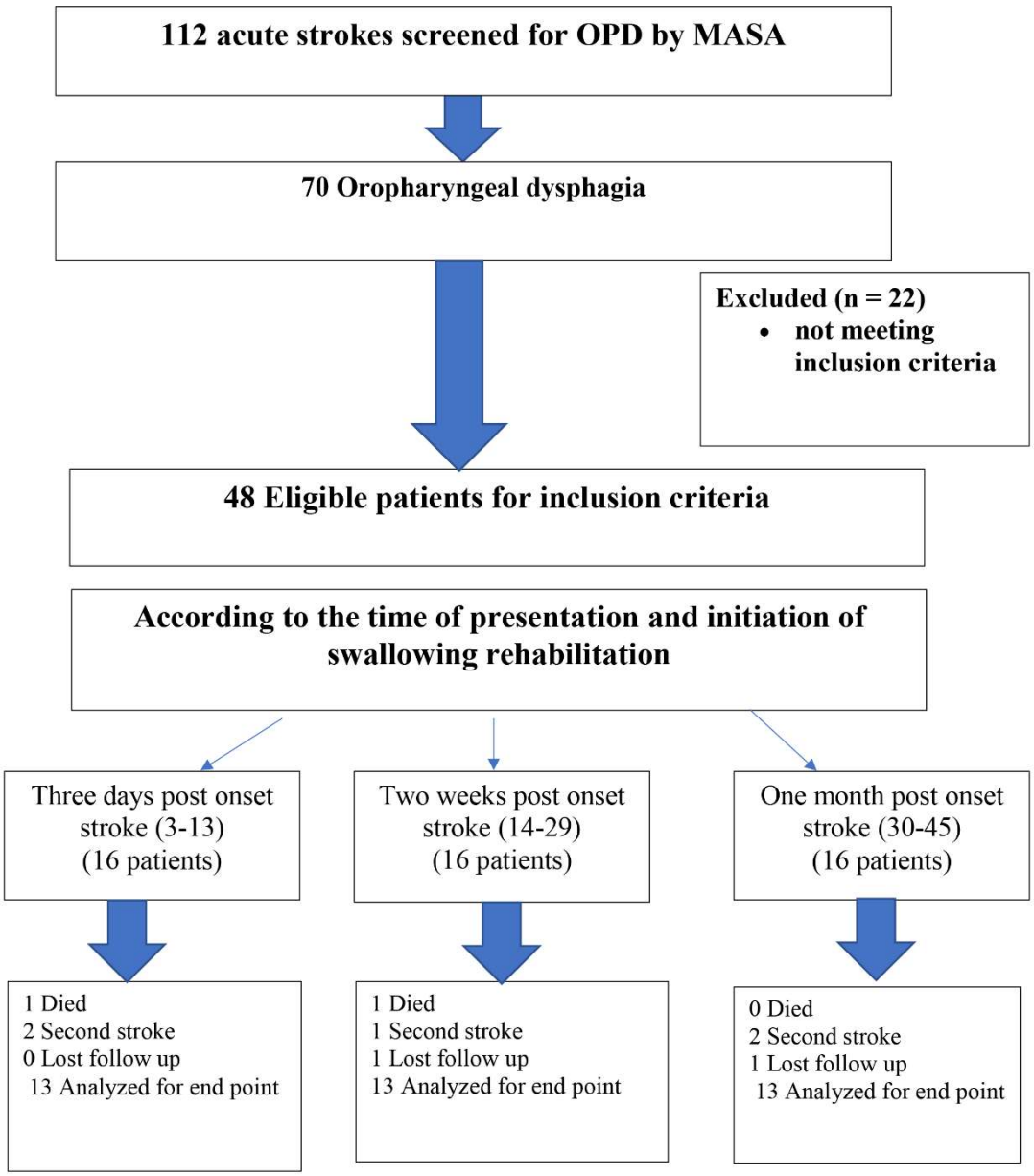
Materials and Methods:

A cross sectional study of 112 acute stroke patients presenting to the swallowing clinic, Alexandria Main University Hospitals through the period from October 2018 to October 2019. They were screened by Mann Assessment of Swallowing Ability (MASA) (12) for the presence of dysphagia. The MASA consists of 24 clinical items comprising four main components: general patient examination (alertness, cooperation, auditory comprehension, aphasia, apraxia, and dysarthria); oral preparation phase (saliva, lip seal, tongue movement, tongue strength, tongue coordination, oral preparation, respiration, and respiratory rate for swallowing); oral phase (gag reflex, palatal movement, bolus clearance, and oral transit time); and pharyngeal phase (cough reflex, voluntary cough, voice, tracheostomy, pharyngeal phase, and pharyngeal response). The MASA score is measured using a 5-point to the 10-point rating scale. The total score of the MASA is 200 points, and the cutoff value is 177 points. The results of the MASA are interpreted as no abnormality (≥178), mild dysphagia (168–177), moderate dysphagia (139–167), and severe dysphagia (≤138). The risk of aspiration is defined based on the total scores into four categories as follows: no abnormality (≥170), mild (149–169), moderate (141–148), and severe (≤140).

Inclusion criteria were: Adult stroke patients above the age of 18 years, conscious, cooperative, Glasgow Coma Scale above 13, primary diagnosis of cortical and subcortical stroke within a maximum of 30 days from the onset of stroke, and Mann Assessment of Swallowing Ability (MASA) score below 177. While patients with these criteria were excluded: ischemic stroke in a brain stem area, patients with a history of swallowing treatment, head and neck surgery, and other neurological or general disorders that can influence swallowing function, presbyphagia, and sarcopenic dysphagia.

Of the 112 stroke patients, 70 had oropharyngeal dysphagia, of whom 48 patients met the inclusion criteria of our study. Of these 48 patients 22 patients were excluded due to follow-up problems, and finally, 39 patients were analyzed **(Figure 1).**

Figure (1): Clinical trial allocation information



The swallowing functions were assessed in the 39 acute cortical and subcortical stroke patients at the time of presentation at the clinic and after two months of swallowing rehabilitation. The patients were allocated into one of three groups according to the time of presentation to the swallowing clinic post-stroke and subsequent initiation of swallowing therapy. Accordingly, patients were divided into (1) early initiation group (3 days up to 13 days after stroke); (2) intermediate group (14 – 29 days after stroke); and (3) late group (30 days up to 45 days after stroke).

Swallowing functions were assessed by a phoniatrician in all patients using functional oral intake scale (FOIS)(13), and Fiberoptic endoscopic evaluation of swallowing (14) to evaluate swallowing safety, efficiency, and measuring Penetration Aspiration Scale (PAS). Swallowing status was determined between 1 and 8 according to the Penetration Aspiration Scale (PAS). According to this, 1 point was defined as normal swallowing, while 2-5 points as penetration, 6-7 points as

aspiration, and 8 points as silent aspiration. Evaluations were applied in a seated situation. Each patient was asked to swallow three swallows of each of the following: (a) 3 ml, 5- and 10-ml thin liquid (b) 3-, 5-, and 10-ml thick liquid (c) 3-, 5-, and 10-ml semisolid and (d) 1/4 of a cookie. It was clinically rated by two Phoniatricians and measuring the ordinal penetration aspiration scale.

Fever productive cough with purulent sputum and abnormal findings in chest examination and chest X-ray were used to diagnose pneumonia.

All patients received 3 sessions per week, each session 30 minutes. The therapy duration was 2 months. All patients were provided with oral care advice including brush teeth before and after each meal and at bedtime, rinse mouth with water, swish and spit out, brush tongue from back to front, using large sweeping strokes, floss teeth daily. For patients with full and partial dentures: remove dentures and clean (brush with a denture brush) before and after meals and at bedtime, brush the tongue from back to front, using large sweeping strokes, with a soft toothbrush, rinse mouth with water, swish and spit out, and soak dentures daily in denture cleaner.

Patients were advised to repeat the trained exercises at home 3 times per day and follow the precautions for safe swallowing, including positioning and slowed rate of feeding. A plan for treatment strategies was tailored for each patient to overcome his problem. Treatment exercises according to the pathology:

- Lingual weakness: oral motor exercises.
- Delayed triggering of the pharyngeal swallow: thermal tactile &/or thermal-gustatory stimulation of the palatal arches with cold/sour stimuli.
- Impaired pharyngeal contraction: Masako maneuver.
- Dysfunction of the upper esophageal sphincter (UES): Shaker exercise and Mendelsohn maneuver.
- Pharyngeal hemiparesis: head turn toward the paretic side of the pharynx.
- Combined lingual and pharyngeal hemiparesis: head tilt towards the healthy side of the pharynx.
- The impaired base of tongue retraction and pharyngeal contraction: Effortful swallow.
- Aspiration before and/or during the swallow (incomplete or insufficient glottis closure: Supraglottic swallow and super- Supraglottic swallow.

Outcome measures after 2 months, at the end of the study, included: (1) Fiberoptic endoscopic evaluation of swallowing (14) (2) Mann Assessment of Swallowing Ability (MASA),(12) (3) Functional Oral Intake Scale (FOIS) (13), and (4) chest x-ray.

Ethical approval for the study was obtained from Alexandria medical school ethical committee approved the study with IRB NO: 00012098.

Written informed consent was obtained from each participant or the next of kin before any examination or intervention was conducted.

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0**.** **(**Armonk, NY: IBM Corp**)**. Qualitative data were described using numbers and percentages. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were

described using range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR). The significance of the obtained results was judged at the 5% level. Comparison between different groups regarding categorical variables was tested using Chi-square test. When more than 20% of the cells have expected count less than 5, correction for chi-square was conducted using Fisher's Exact test or Monte Carlo correction.

Results

This study included 39 stroke patients. According to the demographic data of all patients in this study, 65 years was the median age in all the studied groups. Male patients were predominant in the three studied groups than females. The median for the three groups was 65.0. The median day of initiation of swallowing therapy was: day 7 in group I, day 16 in group II and day 33 in group III. Right-hemispheric lesions were more common than left lesions. In group I 61.5% were right hemispheric lesions, in group II were 69.2% and in group III were 61.5%. There was no significant difference between the three studied groups regarding their demographic data proven by the Kruskal Wallis test and Chi square test. (**Table 1).**

Table (1): **Distribution of the studied cases according to demographic data**

	Group I (n = 13)		**Group II (n = 13)**		**Group III (n = 13)**		**Test of Sig.**	**p**
	No.	**%**	**No.**	**%**	**No.**	**%**		
Age (years)								
Min. – Max.	32.0 – 79.0		51.0 – 76.0		40.0 – 75.0		F= 0.189	0.828
Mean ± SD.	62.08 ± 12.87		64.62 ± 8.28		62.92 ± 10.48			
Median (IQR)	65.0 (57.0 – 71.0)		65.0 (59.0 – 70.0)		65.0 (60.0 – 70.0)			
Sex								
Male	9	69.2	8	61.5	10	76.9	χ^2=	^{MC}p=
Female	4	30.8	5	38.5	3	23.1	0.783	0.907
Initiation of therapy								
Min. – Max.	3.0 – 11.0		14.0 – 22.0		28.0 – 39.0		H=	<0.001*
Mean ± SD.	6.85 ± 3.05		17.08 ± 2.60		33.08 ± 3.20		33.896*	
Median (IQR)	7.0 (4.0 – 10.0)		16.0 (15.0 – 19.0)		33.0 (31.0 – 35.0)			
Site of lesion								
Right	8	61.5	9	69.2	8	61.5	χ^2=	^{MC}p=
Left	5	38.5	4	30.5	5	38.5	0.320	1.000

χ^2: **Chi square test** MC: **Monte Carlo**

H: H for **Kruskal Wallis test,**

*: Statistically significant at $p \leq 0.05$

Measuring the therapy outcome through the Mann Assessment of Swallowing Ability (MASA), there was a significant difference between each group pre-and post-therapy while, there

was no significant difference between the three studied groups post swallowing rehabilitation, **Table (2).**

Table (2): Comparison between the studied groups pre and post therapy according to Mann Assessment of Swallowing Ability (MASA)

	MASA	Before treatment No.	Before treatment %	After treatment No.	After treatment %	Test of sig.	p 1	Test of sig.	p 2
Dysphagia	**Group I (n = 13)**								
	No	0	0.0	6	50.0				
	Mild	3	23.1	5	41.7	Z= 3.035*	0.002*		
	Moderate	9	69.2	1	8.3				
	Severe	1	7.7	0	0.0				
	Group II (n = 13)							χ^2=	
	No	0	0.0	3	25.0			3.177	MCP =
	Mild	3	23.1	5	41.7	Z=2.762*	0.006*		0.564
	Moderate	6	46.2	4	33.3				
	Severe	4	30.8	0	0.0				
	Group III (n = 13)								
	No	1	7.7	6	46.2				
	Mild	3	23.1	4	30.8	Z=2.972*	0.003*		
	Moderate	8	61.5	3	23.1				
	Severe	1	7.7	0	0.0				
Risk for Aspiration	**Group I (n = 13)**								
	No	3	23.1	9	75.0				
	Mild	6	46.2	3	25.0	Z=2.762*	0.006*		
	Moderate	4	30.8	0	0.0				
	Group II (n = 13)								MCP =
	No	1	7.7	7	58.3			χ^2=	0.752
	Mild	6	46.2	5	41.7	Z=3.017*	0.003*	0.835	
	Moderate	6	46.2	0	0.0				
	Group III (n = 13)								
	No	2	15.4	9	69.2				
	Mild	3	23.1	4	30.8	Z=3.025*	0.002*		
	Moderate	8	61.5	0	0.0				
Score	**Group I (n = 13)**								
	Min. – Max.	130.0 – 176.0		165.0 – 194.0					
	Mean ± SD.	153.0 ± 13.03		177.1 ± 9.78		t=8.802*	<0.001*		
	Median (IQR)	150.0 (146 – 166.3)		176.5 (168 – 185.5)					

Group II (n = 13)						
Min. – Max.	120.0 – 175.0	160.0 – 188.0			F=	
Mean ± SD.	147.7 ± 19.09	172.9 ± 8.59	t=5.021*	<0.001*	0.625	
Median (IQR)	150.0(128.5 – 167.3)	172.5(166.5 – 179.3)				0541
Group III (n = 13)						
Min. – Max.	125.0 – 180.0	162.0 – 188.0				
Mean ± SD.	151.5 ± 15.02	174.5 ± 9.29	t=8.004*	<0.001*		
Median (IQR)	148.0(141.5 – 164.5)	172.0 (166 – 185)				

t: Paired t-test , Z: **Wilcoxon signed ranks test**

χ^2: **Chi square test** MC: **Monte Carlo** **F**: **F for ANOVA test**

p1: p value for comparing between each group before and after treatment.

p2: p value for comparing between the studied groups after treatment

*: Statistically significant at $p \leq 0.05$

In group I, 23.1% had no risk for aspiration pre-therapy, while 75% after swallowing rehabilitation had no risk. In group I, there was 46.2 % had mild risk and 30.8% had a moderate risk for aspiration pre-therapy, while twenty-five percent had a mild risk for aspiration after swallowing rehabilitation. In group II only 7.7% had no risk for aspiration pre-therapy and, 58.3% had no risk after swallowing rehabilitation. However, 46.2% had mild risk and 46.2% had a moderate risk for aspiration pre-therapy and, 41.7% had mild risk after swallowing rehabilitation. Group III had 15.4% no-risk, 23.1% had mild risk and 61.5% had a moderate risk for aspiration pre-therapy however, 30.had 8% mild risk for aspiration while, 69.2% had no risk for aspiration after swallowing rehabilitation.

According to the **Functional Oral Intake Scale,** there was a significant difference between each group before and after therapy, while there was no significant difference between the three groups after swallowing rehabilitation, proven by the Kruskal Wallis test (p-value = 0.543). The median before starting swallowing rehabilitation was (4) "total oral intake of single consistency" in groups I and (3) "tube supplements with consistent oral intake" in groups II and III. Meanwhile, the median after swallowing rehabilitation was (6) in all the studied groups "total oral intake with no special preparation, but must avoid specific food or liquid items" **Table (3).**

Table (4) shows a comparison between the three studied groups according to the **fiberoptic endoscopic evaluation of swallow (FEES)** (before and after swallowing rehabilitation). Statistically, there was a significant difference between the three studied groups before and after therapy.

There was an improvement of swallowing function after swallowing rehabilitation shown in the instrumental examination. Where eight percent of group I patients showed premature spillage after swallowing rehabilitation, while 84.6 % before swallowing therap. Also, group II and III showed premature spillage in 16.7% after swallowing rehabilitation, while 76.9% in group II and 53.8 % in group III before swallowing therapy.

The oral preparatory phase was delayed in 84.6% of group I, 92.3% of group III, and all of group II before rehabilitation. However, it became normal in 50.0% of group I and III, while 41.7% of group II after swallowing rehabilitation.

Neither Silent aspiration nor frank aspiration was detected in any patient in all the studied groups after swallowing rehabilitation. Meanwhile, 30.8% of group I, 38.5% of group II and 15.4% of group III showed aspiration, and only one patient in group I showed silent aspiration in the pre-therapy examination.

Penetration was detected in 46.2% of group I and III, and 61.5% of group II before therapy while only 25% of group I and II and 7.7% of group III had penetration after swallowing rehabilitation.

Furthermore, according to **Penetration Aspiration Scale** significant difference was found between group II and group III before and after therapy while there was no significant difference between group I before and after therapy, and there was no significant difference between the three studied groups after swallowing rehabilitation, proven by the Kruskal Wallis test (p-value = 0.435) **Table (5).**

Table (3): Comparison between the studied groups pre and post therapy according to Functional Oral Intake Scale (FOIS)

FOIS	Before treatment	After treatment	Z	p 1	H	p 2
Group I (n = 13)	**(n = 13)**	**(n = 12)**				
Min. – Max.	1.0 – 7.0	5.0 – 7.0				
Mean ± SD.	3.77 ± 1.83	5.83 ± 0.72	2.821*	0.005*		
Median (IQR)	4.0 (2.0 – 5.0)	6.0 (5.0 – 6.0)				
Group II (n = 13)	**(n = 13)**	**(n = 12)**				
Min. – Max.	1.0 – 6.0	5.0 – 7.0			0.621	0.543
Mean ± SD.	2.92 ± 1.71	6.08 ± 0.51	3.071*	0.002*		
Median (IQR)	3.0 (1.25 – 4.75)	6.0 (6.0 – 6.0)				
Group III (n = 13)	**(n = 13)**	**(n = 13)**				
Min. – Max.	1.0 – 6.0	5.0 – 7.0				
Mean ± SD.	3.31 ± 2.02	6.08 ± 0.64	3.081*	0.002*		
Median (IQR)	3.0 (1.50 – 5.50)	6.0 (6.0 – 6.50)				

Z: **Wilcoxon signed ranks test**

H: **Kruskal Wallis test**

p1: p value for comparing between each group before and after treatment.

p2: p value for comparing between the studied groups after treatment

*: Statistically significant at $p \leq 0.05$

Table (4): Comparison between the studied groups pre and post therapy according to Fiberoptic Endoscopic Evaluation of Swallow (FEES)

	VFSS & FEES	Before treatment		After treatment		Test of sig.	p
		No.	%	No.	%		
Premature spillage	**Group I**	11	84.6	1	8.3	McN	0.004*
	Group II	10	76.9	2	16.7	McN	0.016*
	Group III	7	53.8	2	16.7	McN	0.125
Oral preparatory phase	**Group I**						
	Normal	2	15.4	6	50.0	Z= 2.739*	0.006*
	Delayed	11	84.6	6	50.0		
	Group II						
	Normal	0	0.0	5	41.7	Z=2.739*	0.006*
	Delayed	13	100.0	7	58.3		
	Group III						
	Normal	1	7.7	6	50.0	Z=2.565*	0.010*
	Delayed	12	92.3	6	50.0		
Silent aspiration	**Group I**	1	7.7	0	0.0	McN	1.000
	Group II	0	0.0	0	0.0	McN	-
	Group III	0	0.0	0	0.0	McN	-
Aspiration	**Group I**	4	30.8	0	0.0	McN	0.250
	Group II	5	38.5	0	0.0	McN	0.125
	Group III	2	15.4	0	0.0	McN	0.500
Penetration	**Group I**	6	46.2	3	25.0	McN	0.625
	Group II	8	61.5	3	25.0	McN	0.125
	Group III	6	46.2	1	7.7	McN	0.063
Amount of residue	**Group I**						
	No	0	0.0	1	8.3	Z=2.646*	0.008*
	Mild	6	46.2	11	91.7		
	Moderate	7	53.8	0	0.0		
	Group II						
	No	0	0.0	2	16.7	Z=1.508	0.132
	Mild	6	46.2	7	58.3		
	Moderate	7	53.8	3	25.0		
	Group III						
	No	0	0.0	1	8.3	Z=0.302	0.763
	Mild	6	46.2	5	41.7		
	Moderate	7	53.8	6	50.0		

McN : McNamara test , Z: **Wilcoxon signed ranks test**

p: p value for comparing between the studied periods

*: Statistically significant at $p \leq 0.05$

Table (5): Comparison between the studied groups pre and post therapy according to Penetration Aspiration Scale (PAS)

PAS	Before treatment	After treatment	Z	p1	H	p2
Group I (n = 13)						
Min. – Max.	1.0 – 8.0	1.0 – 2.0				
Mean ± SD.	3.08 ± 2.66	1.25 ± 0.45	1.913	0.056		
Median (IQR)	1.0 (1.0 – 5.75)	1.0 (1.0 – 1.75)				
Group II (n = 13)						
Min. – Max.	1.0 – 7.0	1.0 – 3.0				
Mean ± SD.	3.62 ± 2.47	1.33 ± 0.65	2.375*	0.018*	1.663	0.435
Median (IQR)	4.0 (1.0 – 6.0)	1.0 (1.0 – 1.75)				
Group III (n = 13)						
Min. – Max.	1.0 – 6.0	1.0 – 2.0				
Mean ± SD.	2.23 ± 1.88	1.08 ± 0.28	2.226*	0.026*		
Median (IQR)	1.0 (1.0 – 3.0)	1.0 (1.0 – 1.0)				

Z: **Wilcoxon signed ranks test**

H: **Kruskal Wallis test**

p1: p value for comparing between each group before and after treatment.

p2: p value for comparing between the studied groups after treatment.

*: Statistically significant at p ≤

Regarding **the frequency of pneumonia**, there was a significant difference between the three studied groups before and after swallowing rehabilitation. **Table (6), Figure (2).** The presence of pneumonia in the early intervention group was less than in other groups and in the early group, only one patient experienced pneumonia before swallowing rehabilitation meanwhile develops pneumonia after swallowing rehabilitation.

Table (6): Comparison between the studied groups pre and post therapy according to frequency of pneumonia

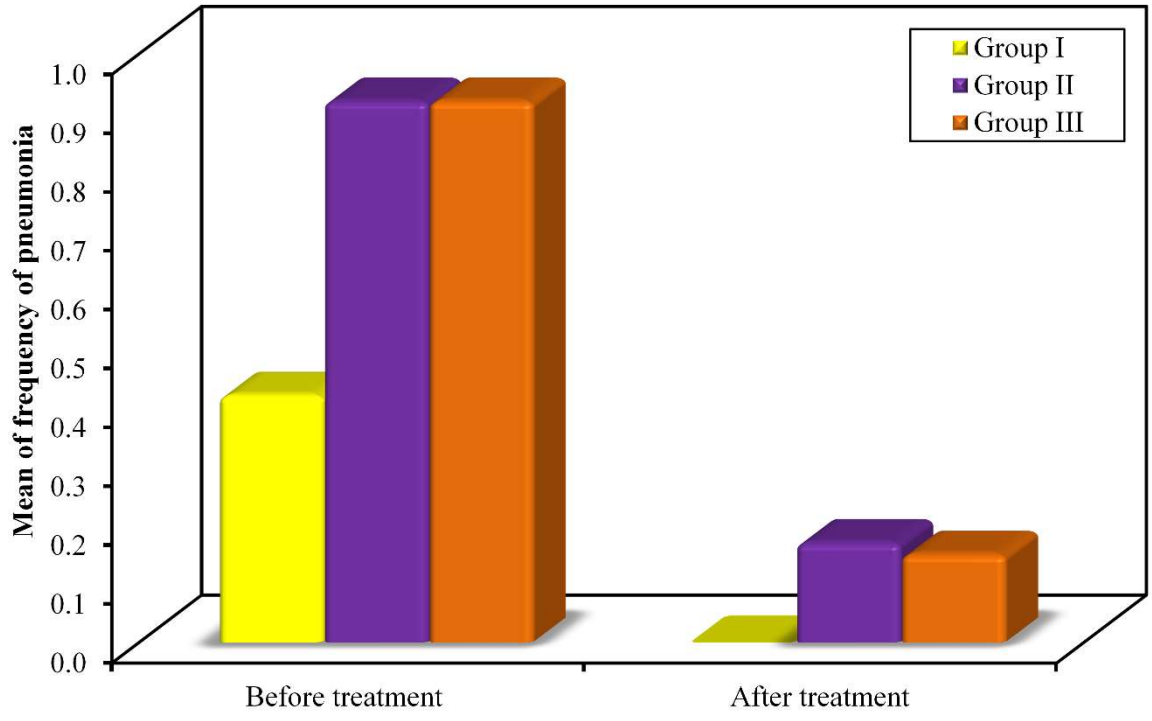
Frequency of pneumonia	Before treatment	After treatment	Z	p
Group I (n = 13)				
Min. – Max.	0.0 – 1.0	0.0 – 0.0		
Mean ± SD.	0.42 ± 0.51	0.0 ± 0.0	2.236*	0.025*
Median (IQR)	0.0 (0.0 – 1.0)	0.0		
Group II (n = 13)				
Min. – Max.	0.0 – 2.0	0.0 – 1.0		
Mean ± SD.	0.92 ± 0.67	0.17 ± 0.39	3.00*	0.003*
Median (IQR)	1.0 (0.25 – 1.0)	0.0 (0.0 – 0.0)		
Group III (n = 13)				
Min. – Max.	0.0 – 2.0	0.0 – 1.0		
Mean ± SD.	0.92 ± 0.86	0.15 ± 0.38	2.640*	0.008*
Median (IQR)	1.0 (0.0 – 2.0)	0.0 (0.0 – 0.0)		

Z: **Wilcoxon signed ranks test**

p: p value for comparing between the studied periods

*: Statistically significant at $p \leq 0.05$

Figure (2): Comparison between the three studied groups according to frequency of pneumonia.



Discussion

The results of our study indicate that the time of initiation of swallowing therapy after stroke has an important role in the recovery of swallowing function improves oral intake, and decreases the risk of pneumonia in acute stroke patients. Dysphagia is a frequent and present alarming symptom that needs urgent attention in patients with stroke, swallowing exercises helps to compensate and make swallowing safer and to modify food textures to make food easier to manage. Thus, swallowing exercises was believed to decrease dysphagia severity and improve the swallowing ability of patients with dysphagia (15).

The results of the present study revealed that there were no statistically significant differences between patients' demographic characteristics and clinical data between the three groups which included age, sex, and site of the lesion.

Depending on the physiologic impairment detected during a FEES, a combination of compensatory and rehabilitative strategies may be used to manage dysphagia symptoms and improve swallowing physiology. Identifying and treating physiologic deficits as well as improving swallowing function are the goals for individuals with dysphagia secondary to stroke (16).

Although there was no significant difference between the three studied groups after treatment, the improvement of swallowing function in the early intervention group was better than other groups which were measured by videofluoroscopic swallowing study (VFSS) and fiberoptic endoscopic evaluation of swallow (FEES). These findings are in agreement with those of Kadir Bahcec, et al. who reported that patients who received swallowing rehabilitation at an early period in stroke within the first 2 weeks 100% improvement was achieved in oral phase problems, and 75-90% recovery in pharyngeal phase disorders with a lesser number of treatment sessions than in patients that same treatment initiated in one month later. Also, in patients who applied treatment after 4 weeks, oral and pharyngeal phase problems were detected which were regressed in 15%, and 45% of the cases, respectively (17).

The findings of our study are also consistent with those of Carnaby et al., who found that their intervention for dysphagia during the first week after stroke improved swallowing ability, but considered the duration of care rather than the time of initiation of it (9). We found an improvement tendency after treatment on 8-point PAS, but it was not statistically significant. The study indicated that treatments might provide some positive therapeutic effects for acute stroke patients with dysphagia.The functional swallowing ability of each individual was estimated using the Functional oral intake scale (FOIS) a 7 pointing rated scale reflecting the patients' report of food/liquids safely ingested by mouth consistently. There was a significant difference between the three groups in functional swallowing ability before and after swallowing rehabilitation while, there was no significant difference between the three groups after swallowing rehabilitation with the median after swallowing rehabilitation was (FOIS level -6) in all the studied groups. However, group, I return to oral intake faster than other groups. The findings of our study are also consistent

with those of Nikhila et al., which found that Rehabilitation swallow therapy has significant improvement in clinical FOIS scores. After therapy, 95.3% of these patients progressed to functional swallowing (FOIS level -5), and the other 4.8% of patients improved after hospital discharge (18).

The most important issue associated with swallowing problems in patients with strokes is a pulmonary complication, while intervention to manage dysphagia at the proper time can reduce these pulmonary complications. This positive effect was demonstrated by the results of this study because early detection and management of dysphagia by swallowing techniques can reduce aspiration in patients with strokes. No silent aspiration or aspiration was detected by Instrumental Examination in the follow-up after rehabilitation. The findings of this analysis align with the principles of Improvement of swallowing function is the key to the treatment and prevention of post-stroke pneumonia (19).

An astringent oral hygiene program is essential for patients at risk of aspiration given that the mouth is the most common location of bacteria. In addition to traditional interventions for dysphagia, all patients should include a comprehensive oral hygiene program in their therapy routine. Multiple studies have demonstrated a preventive effect of oral hygiene on pneumonia and other respiratory tract infections (20).

Furthermore, approximately half of aspirations in stroke patients remain silent (21), which has been linked to worse morbidity and mortality in various studies (22).

As a result, early intervention for dysphagia treatment can help to prevent these pulmonary complications. Early detection and management of dysphagia using swallowing techniques can reduce aspiration in stroke patients, according to the findings of this study.

The following are the several limitations to our study: (1) because of an ethical issue, we did not have stroke patients with dysphagia receive any treatment in a control group to exclude the effect of spontaneous recovery of a swallowing deficit; (2) and another limitation of this study was that two patients were not followed up within the treatment period due to repeated stroke or death.

Conclusion

The results of our study indicate that early treatment of dysphagia improves oral intake and to reduce secondary complications such as pneumonia and allow for spontaneous recovery of swallowing function. For those with dysphagia persisting beyond the acute phase, it is crucial to continue treatment that, in addition to reducing secondary complications, targets the physiologic deficits caused by the stroke with the goal of improving swallowing function or compensating for lost function.

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The effect of early intervention of swallowing therapy on recovery from oropharyngeal dysphagia in stroke patients

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Ethics approval and consent to participate

This study was approved by the local Ethical Committee at our institution. The participants provided written consent.

Conflicts of interest

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