

## Effect of early dysphagia therapy on improving swallowing difficulties in stroke patients with swallowing disorder

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### Abstract

**Background:** Dysphagia is a prevalent and important symptom that occurs after a stroke. The aim of physical therapy for dysphagia is to avert aspiration, dehydration, and malnutrition by restoring functional and physiological swallowing. **Aim:** To evaluate the effectiveness of evaluate the Effectiveness of Early Dysphagia Therapy on Improving Swallowing Difficulty in Stroke Patients. **Methods:** A quasi-experimental research design was consumed. **Setting:** This proposal was achieved in neurology department and related outpatient clinic affiliated to Mansoura University Hospital, Egypt. **Tools:** Four tools were utilized **1)** patient's assessment sheet; **2)** National Institute of Health Stroke Scale (NIHSS); **3)** Dysphagia Outcome Severity Scale (DOSS); **4)** Dysphagia Handicap Index (DHI). **Results:** The study group showed a highly significant enhancement in swallowing abilities (0.0001) and quality of life compared to the control group. Moreover, there is a notable relationship between enhancement in swallowing abilities and improved quality of life. **Conclusions:** The current study highlighted sufficient evidence that dysphagia therapy was effective in enhancing swallowing abilities and quality of among stroke patients. **It is recommended** to use dysphagia therapy as a routine part of care for stroke patients with swallowing difficulties.

**Keywords:** early, dysphagia therapy, swallowing difficulties, stroke patients

### Introduction

Brain stroke presents significant medical and societal challenges, and considered the main reasons of disability and death. strokes occurrence of is increasing, with increased death rate early following a stroke. The most common complication experienced by stroke patients is dysphagia. In patients who have suffered a stroke, the existence of clinically evident dysphagia significantly influences their chances of survival (Mozzanica et al., 2018).

Dysphagia refers to the challenges in swallowing safely and/or efficiently. It is not an illness, but a symptom, and its prevalence ranges from 19% to 81%.

It is unfortunate to note that 81% of patients who first have dysphagia will have chronic dysphagia within six months (Toscano et al., 2022). Due to the prevalence of dysphagia and its significantly high rate, it is essential to comprehend the potential factors that contribute to this condition following an ischemic stroke. The complex swallowing process necessitates the coordination of several motor, sensory, and mental processes. An ischemic stroke causes functional problems in any swallowing-related area, such as the mouth, pharynx, larynx, and esophagus. This significantly impairs swallowing safety and effectiveness and mostly manifests as changes in nutritional and respiratory health (Speyer et al., 2021).

Actually, timely identification and implementation of appropriate treatment methods diminish the impacts of swallowing difficulties and decrease dysphagia related mortality after a stroke. The aim of dysphagia therapy for is to avoid aspiration, dehydration, and malnutrition by restoring functional and physiological swallowing (Longo et al., 2018).

The current method of addressing dysphagia incorporates compensatory techniques that enable secure swallowing yet do not modify long-term function, in addition to rehabilitative exercises focused on improving swallowing skills and reinstating the consumption of regular food and beverages. Rehabilitative exercises may be indirect, focusing on motor activities that do not include swallowing, or direct, featuring motor activities that involve swallowing (Attrill et al., 2018).

### **Clinical rational for the study**

Dysphagia is a prevalent and important symptom that occurs after a stroke. Dysphagia, or difficulties with swallowing, impacts one third to more than two thirds of individuals following a stroke. Dysphagia leads to medical issues, such as higher rates of hospitalization, morbidity, and the potential for aspiration pneumonia. It is also linked to negative psychosocial health effects, including worse nutrition, hydration, and overall quality of life (Powers et al., 2018). So, evaluate the effects of early dysphagia therapy on improving swallowing difficulties in stroke patients with swallowing disorder is needed.

### **Operational definition**

### **Dysphagia therapy**

Dysphagia treatment comprises compensatory positions, stimulation of the swallowing reflex, exercises to enhance facial muscles (training of the orbicularis oris), breathing exercises, and educating patients on safe swallowing and the choice of suitable food textures (Bath, Lee & Everton, 2018).

**Study aim:** evaluate the Effect of early dysphagia therapy on improving swallowing difficulty in stroke patients with swallowing disorder. Furthermore, it was intended to test the following hypothesis:

**H0.** Early dysphagia therapy in brain stroke patients has no effect swallowing difficulties

**H1.** Swallowing reflex will be improved after early dysphagia therapy

**H2.** Early dysphagia therapy in brain stroke patients will limit swallowing complications

### **Method**

**Research Design:** A quasi-experimental study was conducted to assess the effectiveness of early dysphagia therapy on improving swallowing difficulties in stroke patients with swallowing disorder.

**Research Setting:** This proposal was achieved in both neurology department (stroke unit) and outpatient clinic (Neurology clinic) at Mansoura University Hospital, Egypt.

**Research Subjects:** A purposive sample of 100 stroke patient agreed to contribute in in our research, and were equally allocated to study and control

groups using a computer randomisation program (ALEA).

Sample size was estimated after taking into consideration the total number of cerebral stroke patients admitted to neurology department (during 2018), alpha error 5% (= confidence level=95%) Beta error 20% (=study power= 80%). The calculated sample size comes out to be 92.4 patients. To account for expected drop-outs, an additional patient was added, so the sample size was 100 patients.

**Participants' inclusion criteria:** Conscious stroke patients, age 20-60 years from both genders, and able to follow commands

**Participants exclusion criteria:**

Cognitive function disorders preventing cooperation (NIHSS 21-42), complete aphasia, anarthria, bilateral facial nerve paralysis, and individuals with an inserted tracheostomy tube.

**Study tools:**

To gather foundational information 4 tools were utilized.

**Tool I: "patient's assessment sheet"**

Patient's assessment sheet was used to identify patient's demographic characteristics as age, sex, marital status etc., and past medical history.

**Tool II: National Institute of Health Stroke Scale (NIHSS) (Goldstein et al, 2005)**

A systematic, numerical evaluation instrument to assess neurological deficits related to stroke. In clinical settings, it can be utilized to assess and record neurological condition in acute stroke patients

**Scoring system**

Ratings for each item are scored with 3 to 5 grades with total score of 0 = normal, 1-4 = minor stroke, 5-15 = moderate stroke, 16-20 = moderate to severe Stroke and 21-42 = severe stroke. Patients with a baseline NIHSS score of less than 5 generally have a favorable prognosis. It strongly predicts outcomes and response to interventions, thus it has face validity (0.977).

**Tool III: Dysphagia Outcome Severity Scale (DOSS) (O'Neil, Purdy, Falk & Gallo, 1999)**

A straightforward and easy to use seven-level scale designed to assess the severity of dysphagia can suggest the level and dependency for feeding. **Level 1:** severe (cannot tolerate food), **level 2:** moderate-severe (certain food consistency cannot tolerated), **Level 3:** moderate (restriction of certain types of food), **Level 4:** mild-moderate (intermittent supervision during feeding), **Level 5:** mild (distant supervision), **Level 6:** swallowing within functional limits/modified independence and **Level 7** normal swallowing.

**Tool IV: Dysphagia Handicap Index (DHI)**

The Dysphagia Handicap Index (DHI) was initially created and validated by **Silbergleit, Schultz et al., (2012)**. It is a quality of life scale used to measure the effect of dysphagia on patients' life. It is made up of 25 statements assessed on a three-point ordinal scale (i.e., never = 0; sometimes = 2; or always = 4), where greater scores reflect a more significant effect on patients' quality of life. The

questionnaire ends with one question regarding patients' perception of dysphagia severity, employing a seven-point scale featuring three reference points (1 = normal swallowing; 4 = moderate swallowing issue; and 7 = severe swallowing issue). The internal consistency for the total DHI score was 0.962.

#### **Fieldwork and Data Collection:**

Fieldwork consists of four sequential phases to achieve its aims.

#### **Preparatory phase**

In this phase, the researchers create research instruments by carefully reviewing academic literature (**Bath, Lee & Everton, 2018; Cabib et al., 2016; and Langmore & Pisegna, 2015**). After finalizing the English version, it was translated into Arabic and then back translated into English. We also examined the content validity and reliability of the tool mentioned earlier. We obtained written permission from the relevant authorities at the beginning of the study.

#### **Planning Phase**

Based on a review of current literature, the researchers developed the instructional content, intended outcome, and instructional video in simple Arabic (**Bath, Lee & Everton, 2018; Cabib et al., 2016; and Langmore & Pisegna, 2015**).

#### **Implementation Phase**

• The researchers joined the previously mentioned setting from the beginning of March 2018 until the end of November 2021 and all participants who satisfied the specified parameters were incorporated into the study.

- The researchers start dysphagia therapy training sessions to be competent and to ensure that any of them can complete dysphagia therapy for the same patient in the same way and standard quality
- The researchers conducted physical baseline outcome assessments, which included:
  - The neurological status assessed by NIHSS was one of the physical baseline outcome assessments that the researchers carried out. Dysphagia is identified with excellent sensitivity (88%) and specificity (85%) when the NIHSS score is 12. Additionally, it was found that laryngeal muscle indicators such as aspiration, dysarthria, and an NIHSS score of  $\geq 12$  were independent predictors of post-stroke dysphagia (**Ko et al., 2021**).
  - All patients were assessed for their swallowing abilities through the Modified water swallowing test (MWST). In this examination, 3 ml of chilled water was administered to the floor of the mouth using a syringe, and the patient is instructed to execute 2 dry (saliva) swallows. The complete process was conducted two additional times. **Criteria:** Score 1= inability to swallow, Score 2 = swallowing with dyspnea, Score 3 = swallowing with cough or wet-hoarse dysphonia, Score 4 = ability to swallow without coughing and Score 5 ability to swallow and

could perform two additional dry swallows within 30 s (**Daniels, Anderson & Willson, 2012**).

- Patients were observed while consuming their meals.
- The American Heart Association's 2018 guidelines for treating acute ischemic stroke state that "appropriate secondary prevention measures should be implemented within 2 weeks of stroke onset." (**Powers et al., 2018**).
- The therapy was given for two weeks (15 days including vacations), with an average of 60 minutes each day and five to ten sets per day. It also included additional interaction with patients at every meal (**Gao & Zhang, 2017**).
- The therapy was carried out in semi-sitting and sitting orientations, which proved advantageous for enhancing movement of head and thorax.
- Dysphagia therapy methods focus on particular muscles or muscle groups involved in swallowing, which include the oral muscles, pharyngeal constrictors and enhancing facial muscles along with the respiratory muscle complex (strength training for both inspiratory and expiratory muscles) (**Krekeler, Rowe & Connor, 2021**), stimulation of the swallowing reflex, sensory stimulation, and education on safe swallowing and the choice of suitable food texture (**Bath, Lee & Everton, 2018**).

- Using a laryngeal mirror that had been chilled on ice, thermal stimulation was applied to the palatine arches in individuals with impaired or sluggish swallowing reflexes (five stimulations, five swallows; the same was true for the opposite palatine arch).
- Thermal stimulation using an ice cube was applied to the outside of the cheeks, as well as to parts of the tongue and cheeks, to improve the sensation in the mouth.
- Education on safe food and drink consumption was given to patients in both groups as well as their caretakers.

#### Evaluation phase

- The effect of dysphagia therapy on improving swallowing dysfunction on stroke patient was assessed through comparisons between the pre and post-tests for both studied groups after 15 day using tools (tool III).
- The effect of dysphagia therapy on improving quality of life on stroke patient was assessed through comparisons between the pre and post-tests for both studied groups after 6 months using tools (tool IV).

#### Statistical analysis

Version 22 of the Statistical Package for the Social Sciences (SPSS) was used to analyze the data that had been gathered. The researcher examined, categorized, and then coded each tool's content. Numbers and percentages were used to define categorical variables, and

paired nominal data described by the McNemar test—a nonparametric test. For statistical analysis, we used the test of Wilcoxon to assess the sensibility to change.

## Results

**Table (1)** According to gender, male gender is more common than females with percentage of 52.0% and 54.0% for study and control group respectively, with mean age  $52.5 \pm 5.6$  for the study group and  $51.3 \pm 5.4$  for control group. In relation to marital status most of our studied groups (70.0% for study and 58.0% for control) were married. As regard the Education slightly more than half (54.0%) of study group and about one third (30%) of control group were illiterate. In relation to occupation 64.0% of study group and 52.0% of control group were not working. Ischemic stroke was more prevailing among study and control group (88.0% and 80.0% respectively).

**Table (2)** notes a statistically significant improvement in swallowing ability in study group ( $P=0.001^*$ ) compared to control group ( $P=0.468$ ) after application of dysphagia therapy

**Table (3)** illustrated there were no statistically significant difference in all aspects of quality of life Physical (0.072), Functional (0.154) and Emotional (0.421) among control group. Where is in study group there were a highly statistically significant difference founded in Physical (0.001), Functional (0.001) and Emotional (0.001) aspects of quality of life after application of dysphagia therapy.

**Figure (1)** shows according to total score of (DHI Scale) there were a highly statistically significant difference in quality of life among study group compared to control group ( $P < 0.0001$ ) after application of dysphagia therapy. It illustrated that, the total mean score of quality of life in study group were 57.56 decreased to 23.45 after dysphagia therapy. Whereas in control group total mean score were 60.32 in pretest decreased to 55.48 in posttest.

**Table (4)** illustrated that the dysphagia level was inversely correlated with the quality-of-life (pre dysphagia therapy 0.002 and post dysphagia therapy 0.006).

**Table 1.** Demographic characteristics of the studied groups (N=100)

Demographic Data	Group				Test (P)
	Study (N = 50)		Control (N = 50)		
	No	%	No	%	
Age					$X^2 = 2.2$ (0.327)
▪ 40-50	16	28.0 %	18	36.0%	
▪ > 50	36	72.0 %	32	64.0%	
Mean ± SD	52.5 ±5.6		51.3 ±5.4		T = 0.35 (0.731)
Sex					$X^2 = 0.16$ (0.687)
▪ Male	26	52.0%	27	54.0%	
▪ Female	24	48.0%	23	46.0%	
Marital status					$X^2 = 6.0$ (0.049* <sup>^</sup> )
▪ Married	35	70.0%	29	58.0%	
▪ Widow	15	30.0%	21	42.0%	
Education					$X^2 = 3.4$ (0.338 <sup>^</sup> )
▪ Illiterate	20	54.0%	15	30.0%	
▪ Primary	4	8.0%	9	18.0%	
▪ Secondary	13	18.0%	9	18.0%	
▪ Highly educated	17	20.0%	17	34.0%	
Occupation	18	36.0%	24	48.0%	$X^2 = 2.4$ (0.328 <sup>^</sup> )
▪ Working					
▪ Not working	32	64.0%	26	52.0%	
Diagnosis					$X^2 = 0.44$ (0.505)
▪ Ischemic	44	88.0%	40	80.0%	
▪ Hemorrhagic	6	12.0%	10	20.0%	

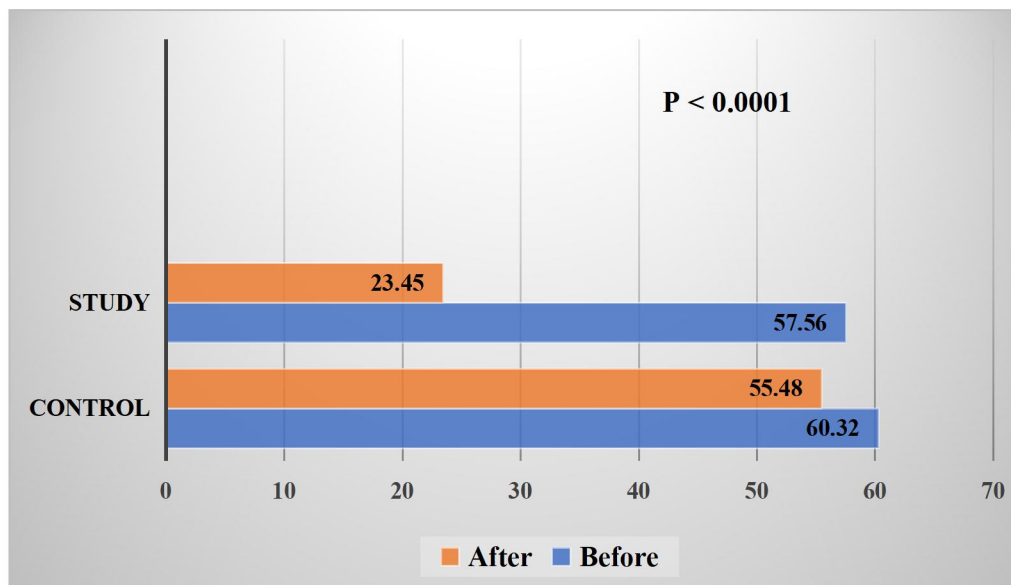
**Table 2.** Distribution of the studied groups according to level of dysphagia (DOSS Scale)

DOSS Scale	Study Group		P	Control Group		P
	Before N (%)	After N (%)		Before N (%)	After N (%)	
Level 1	4(8%)	1(2%)	<b>0.001*</b>	3(6%)	1(2%)	<b>0.468</b>
Level 2	4(8%)	0(0%)		5(10%)	4(8%)	
Level 3	6(12%)	0(0%)		7(14%)	8(16%)	
Level 4	6(12%)	4(8%)		7(14%)	6(12%)	
Level 5	10(20%)	15(30%)		9(18%)	10(20%)	
Level 6	15(30%)	17(34%)		12(24%)	11(22%)	
Level 7	5(10%)	13(26%)		7(14%)	10(20%)	

**Table 3.** Comparison between studied groups in relation to quality-of-life (DHI subscales)

DHI Scale	Study		P	Control		P
	Before	After		Before	After	
Physical	17.5±8.3	8.4±9.6	<b>0.001*</b>	18.1±7.9	15.3±5.8	<b>0.072</b>
Functional	15.5±10.5	7.1±4.5	<b>0.001*</b>	16.1±10.5	12.5±18.5	<b>0.154</b>
Emotional	12.2±9.3	10.2±8.5	<b>0.001*</b>	11.2±10.6	10.6±9.8	<b>0.421</b>

**Figure 1.** Comparison between studied groups in relation to quality-of-life (DHI total score)



**Table 4.** Correlation between Quality-of-Life total scores and dysphagia level

Quality-of-Life	Dysphagia Level	
	R	P
Pre-intervention	-0.626	0.002*
Post intervention	-0.384	0.006*

## Discussion

Approximately 80% of all strokes are ischemic strokes, which are the most common cause of dysphagia globally. According to research, between 40% and 60% of people experience dysphagia following an acute ischemic stroke, and over 50% of those affected still experience it six months later (Toscano et al., 2022). Ischemic stroke causes functional deficits in any area related to swallowing (including the mouth, pharynx, larynx, and esophagus), which significantly affects the safety and efficiency of swallowing and primarily shows up as changes in

nutritional and respiratory health (Ye, Huang et al., 2018). Therefore, all ischemic stroke survivors need to have their swallowing abilities assessed, and those who are at risk for dysphagia following the initial screening should undergo further testing (Speyer et al., 2021).

Exercise-based approaches are an effective treatment for dysphagia, which enhance the strength and stamina of swallowing and airway safeguarding (Krekeler et al., 2021). The study at hand pertains to evaluating the Effect of early dysphagia therapy on improving



swallowing difficulties in stroke patients with swallowing disorder

The current study ascertained that the six decade of life accounted for the bulk of study participants. This discovery's reasoning stems from the fact that stroke often manifests in people over 50 and progressively worsens as a result of aging process and chronic disease pathophysiological alterations, which was confirmed by studies by **Khedr et al., (2021)** and **Hamzic et al., (2021)**.

In this study, ischemic stroke was more prevailing and commonly occur in men than women. Similarly, the studies by **Vyas et al., (2021)** and **Hägglund et al., (2020)** shows, recent data indicate that throughout the lifespan, males face an increased risk of ischemic stroke and transient ischemic attack (TIA) during midlife compared to women, with the risk becoming equal after the age of 80. This result may be attributed to the understanding that sex denotes the biological traits of individuals, encompassing genetic, biological, and physiological expressions.

When compared to baseline, the current study found a statistically significant improvement in swallowing ability in study group after 8 weeks of dysphagia therapy compared to control group. The primary explanation for this outcome is clearly articulated by the aging process that impact of skeletal muscle via resistance training and increased swallowing muscle thickness

Our results were consistent with **Guillén-Solà et al., (2018)** and **Kim et al., (2018)** proved that after 2 to 3 week of dysphagia therapy, stroke patients demonstrated enhancements in clinical indicators of swallowing safety. Also **Moon et al. (2018)** recorded that Exercise-based dysphagia therapy is suggested as a straightforward and effective rehabilitation method to enhance swallowing in individuals with dysphagia. Another study by **Choy, Pourkazemi et al. (2022)** found that the present approach to managing dysphagia includes both compensation and rehabilitation. Rehabilitative exercises enhance swallowing abilities and the return to consuming regular diet.

This result is also similar to study by **Matos et al., (2022)** they emphasize that the most recognized treatment approach for a delayed swallowing reflex is tactile stimulation, which has been shown to yield positive outcomes either independently or when combined with different rehabilitation therapies. These findings are consistent with a study carried out by, **Krajczyk et al., (2019)** explains that dysphagia therapy is a targeted approach for dysphagia that aims to strengthen the submental muscles, which is essential for improving the swallowing muscles and ensuring safe swallowing in stroke patients who often experience swallowing challenges.

In agreement is the trial of **Choi, Jung & Park, (2020)** and **Krajczyk et al., (2019)** highlighted that Resistance exercises lead to sufficient muscle contractility during swallowing, which

has a direct impact on kinematic results and subsequently affects airway protection by improving epiglottis tilting and the swallowing mechanism, as well as the expansion of the upper esophageal sphincter.

In a similar vein, **Park, Oh, Yoon & Park, (2019)** illuminate that exercise-Based Dysphagia Rehabilitation (EBDR) is recognized for producing significant muscle activation by applying resistance to the oropharyngeal muscles, consequently enhancing swallowing abilities. Likewise, similar findings were reported in a study conducted by **Choi, Jung & Park, (2020)** and **Yano et al., (2020)** confirmed that dysphagia therapy is effective for increasing tongue strength for safe swallowing.

Lately, QoL has originate to play a crucial role in dysphagia management. It is defined by WHO as “individual perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns” (**Sielska-Badurek et al., 2023**).

The results of current study showed a highly statistically significant difference founded in all aspects of quality of life after application of dysphagia therapy compared to control group. From the researcher point of view this result may be attributed to that, Quality of life as a multidimensional concept is completely individual and cannot be observed by others and is based on an individual’s perception of various aspects of their lives in the cultural context

Similarly, the study by **Matos et al., (2022)** as they reported that Dysphagia is a symptom that can potentially be treated in patients who have had a stroke and warrants attention, as addressing it may enhance the quality of life for these individuals **Vieira et al., (2018)** proved that Patients with dysphagia may adopt new eating methods for safe and effective swallowing, and these alterations in eating habits can result in depression and social isolation, ultimately causing dissatisfaction with their quality of life. In a review study, **Kim et al., (2020)** found that dysphagia, like other chronic conditions, adversely impacted patients' quality of life.

Our study results illustrated that the dysphagia level was inversely correlated with the quality-of-life. These results are consistent with previous studies by **Krajczyk et al., (2019)** they reported that dysphagia can lead to a deterioration in patients' quality of life; however, dysphagia therapy can enhance swallowing abilities, reduce choking incidents, minimize coughing, and enhance voice quality, ultimately improving overall quality of life. Concurrently, the research conducted by **Bakhtiyari et al. (2020)** demonstrated that dysphagia negatively impacted participants’ emotional state and decreasing QoL.

Similarly, **Kjaersgaard and Pallesen (2020)** reported that patients with dysphagia created self-management techniques. Additionally, patients conveyed that adjusting to

dysphagia was essential for leading a fulfilling and worthwhile life with loved ones, thus adopting a hopeful perspective to improve their quality of life. Our results were consistent with **Hellden et al. (2018)** also found patients would modify social situations, highlighting that dysphagia required participants to prepare in advance to avoid unwanted situations, emotions, and symptoms, enhancing their quality of life. **Moon et al., (2019)** suggests that the dysphagia therapy positively impacts stroke patients who experience dysphagia. Greater satisfaction with rehabilitation results in enhanced motivation and better quality of life

## Conclusion

The results confirm our hypothesis that exercise based dysphagia therapy might improve the swallowing abilities and improve quality of life in patients with dysphagia after stroke.

## Recommendations

A huge, practical trial is required to look at the viability and cost-effectiveness of this intervention. The current study should be done once more with a bigger sample for generalization of the results.

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