The Incidence of Post Stroke Pneumonia and the Use of Modified Water Swallowing Test in Acute Stroke Patients

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Abstract

Background and Objective: Dysphagia is a common problem after stroke which may lead stroke patients to have a potential for life-threatening complications such as pneumonia. Therefore, the universal screening of swallowing function is recommended. This study aims to evaluate a result of modified water swallowing test (MWST) applied in stroke units and incidence of pneumonia after stroke.

Materials and Methods: Data were collected from the Maharat Nakhon Ratchasima stroke registry between January 1, 2017 to December 31, 2017.

Results: A total of 98 patients were enrolled, of these 64 (69.4%) patients were documented MWST and 34 (34.7%) patients were not. In the documented group, 45 (71.4%) patients met the MWST screening criteria, 25 (55.6%) patients passed and 20 (44.4%) patients failed the screening test but only 3 (5.3%) patients were referred for a rehabilitation program. Incidence of aspiration pneumonia was 73.5 % (72 of 98 patients). In a group of patients who were screened by MWST, pneumonia was found in 85% (17 of 20 patients) of patients with MWST score 1-4 (failed) and 60% (15 of 25 patients) with MWST score 5 (passed).

Conclusion: Most stroke patients have dysphagia screening but only a few patients who failed screening were referred for swallowing rehabilitation program. The further expansion of the screening strategies, and management is necessary to reduce post stroke pneumonia.

Keywords: dysphagia screening, modified water swallowing test, post stroke pneumonia

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Introduction

Stroke is a major public health problem in Thailand. Stroke becomes the first leading cause of premature death in females and the second leading cause in males. Mortality rate of stroke was 38.6, 43.3 and 43.5 per 100,000 population from 2014 to 2016, respectively[1], and it has been continuously increasing every year. Furthermore, incidences of stroke in Thailand have been increased and the prevalence of stroke in patients older than 45 years old is approximately 1.9%[2]. It is necessary to develop a comprehensive care system for stroke patients especially in acute phase to reduce complications such as pneumonia[3] which is common and causes the highest attributable mortality after stroke[4].

From a report of the Maharat Nakhon Ratchasima stroke care team, stroke mortality rate was 16.2%, 14.8% and 14.4% in 2016, 2017, and 2018 respectively. Tungkaserirak et al. studied 245 acute stroke patients and found that 45.6% of patients had swallowing disorders, and factor related to the occurrence of pneumonia was patients with abnormal swallowing (OR=3.1, 95%CI=1.2-8.1, p=0.01)[5].

Swallowing disorders can be found approximately 37-78 % depending on the evaluation method[6]. For instance, the incidence of pneumonia can be found up to 80% when using instrumental testing[7]. Not only was pneumonia a common complication after stroke and the leading cause of death in stroke patient, but dysphagia also leads to dehydration and malnutrition, which may eventually lead to other chronic complications such as chronic renal insufficiency and sepsis which is a problem that affects the care of stroke patients[8, 9]. Therefore, it is necessary to evaluate every stroke patient's swallowing disorder to provide initial care for eating safely and selecting food for feeding properly.

Currently, the gold standard of swallowing assessment is to evaluate by using video fluoroscopic swallowing examination or video endoscopic swallowing examination. However, the instrumental assessment may not be practical for all stroke patients. Therefore, trying to find sensitivity and specificity of clinical swallowing examination is necessary to detect the risk of aspiration and swallowing problems after stroke at bedside[10]. Clinical swallowing examination has been developed in different ways such as dry swallowing test method which patients have to swallow saliva then the movement of the laryngeal elevation while swallowing will be checked, water swallow test method which is a test for assessing an ability to swallow variety of clear water such as 3, 5, 10, 50, 60, 90 and 150 mL and observe clinical of coughing, wet-hoarse vocal quality or dyspnea during or after swallow that suggest the possibility of having swallowing disorder requires additional test and is unsafe for oral food intake[11]. In the last few years, the patients in stroke unit have been tested by Modified Water Swallowing Test (MWST) which the patients must swallow 3 mL of water and swallowing problems are observed before starting oral feeding. Before screening with MWST, the stroke patients must meet three criteria including following the command, good sitting balance and Glasgow Coma Scale ≥ 11. MWST is simple in clinical practice and suitable as a bedside screening test for stroke patients with sensitivity and specificity to detect swallowing problem 55.3 % and 80.8 %, respectively[12].

Nowadays, the guideline of swallowing assessment and outcome of assessment are scarce. The purpose of this study is to evaluate the results

of the MWST method tested in acute stroke patients and the occurrence of pneumonia which is a major complication at stroke unit in Maharat Nakhon Ratchasima Hospital. The information gained from this study can be used as a basis for further development of stroke care systems.

Methods

Study design

A retrospective descriptive study in acute stroke patients who were admitted to the stroke units, Maharat Nakhon Ratchasima Hospital. Inclusion criteria include (1) Age ≥ 18 years old (2) clinical diagnosis of stroke including ischemic stroke and hemorrhagic stroke (3) admitted in the stroke unit of Maharat Nakhon Ratchasima Hospital between January 1, 2017 to December 31, 2017. Exclusion criteria were (1) Patients with history of dysphagia prior to the index stroke (2) endotracheal tube was inserted before being admitted.

Definition

Stroke is any disease that interrupts blood supply to the brain, which cause cell death and loss function of the brain[13].

Stroke units in this study refer to the wards where patients were admitted and treated as acute stroke.

Pneumonia is a bacterial or viral infection of the lungs Symptoms include fever, chills, shortness of breath, coughing that produces phlegm, and chest pain[14].

Data collection

We collected data from medical records of all stroke patients who met the inclusion criteria. Three parts of the following data sets were recorded. The first part is demographic data such as age, gender, and underlying disease. The second part is an information about stroke such as stroke onset, types of stroke and complications including pneumonia. The third part is an information of swallowing disorders evaluate by using MWST method and an initial treatment after the assessed.

Patients were eligible for the study if they had (1) an acute stroke, (2) able to sit upright, have good attentive and well cooperative or GCS ≥ 11 (3) suited for eating food or drinking water. The eligible patients will be screened by MWST method before starting oral eating.

Modified water swallowing test (MWST)[15]

The patients must swallow 3 mL of clear water followed by dry swallow 2 times and assessment the swallowing by using MWST. If the first MWST score is 1 to 3 then terminate the assessment. If MWST score ≥ 4, repeat the test again and record the lowest score. The score of MWST is shown below,

Score 1 No swallow, cough and/or frequent breathing

Score 2 Swallow with frequent breathing

Score 3 Swallow with normal breathing, cough and/or wet-hoarse voice

Score 4 Swallow with normal breathing, no cough, no wet voice

Score 5 Score 4 + 2 additional swallows in 30 seconds

If the score is 1-4, it is suggested to feed via nasogastric tube then consult rehabilitation physicians and occupational therapists for evaluation and proper management.

Statistical analysis

Analyze the data with computer analysis program SPSS version 10 by using descriptive

statistics such as number, percentages, mean and standard deviation as appropriate.

Results

The total of 102 stroke patients was admitted in the stroke units. Of these, 51 were male and 51 were female. Age at the stroke onset was varied, 29.4 % were aged 76–85 years old, 20.6 % were aged 66–75 years old, and 5.1 % were aged < 45 years old (stroke in the young)[15]. Onset-to-door time was document as < 6 hours in 57.1%, 6 hours to 24 hours in 25.5%, > 1 day in 19.6 %. Most patients were living outside Mueang district (78.5%), followed by patients living in Mueang district (22.4%) and patients from other provinces (3.0%).

Ischemic stroke, hemorrhagic stroke and transient ischemic attack were found in 61.2%, 38.7% and 4.1% respectively. Hypertension was the most comorbidity (56.1%) and the second was communication problem (aphasia) (38.8%). Length of stay < 3 days was found in 42.8 % and 3 days to 1 week was found in 33.7%. The first group was referred to the district hospital for subacute care and the latter with the length of stay > 1 week was the patients with complications such as pneumonia or renal complication. Pneumonia is the most common complication found in 73.5% when excluding four TIA patients, as shown in Table 1.

Figure 1. *Flowchart for patient's screening with the Modified Water Swallowing Test*

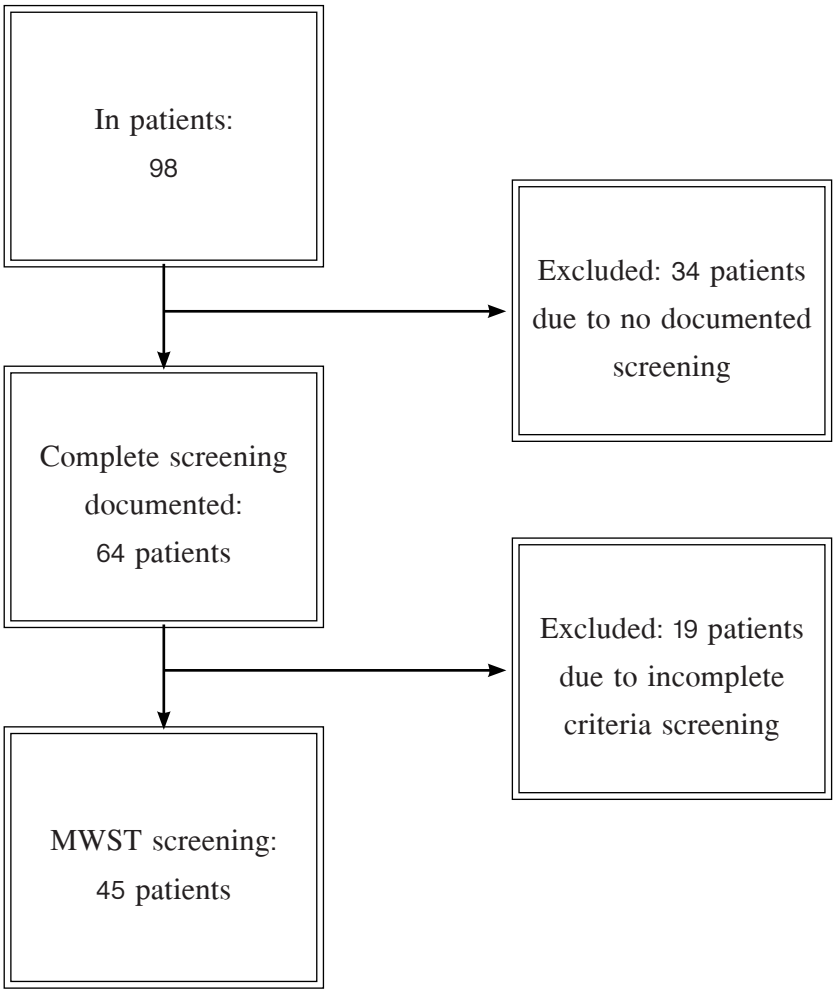


Table 1. *Demographics and clinical characteristics of patients.*

Information	Number of patients	Percent
Sex		
Male	51	50
Female	51	50
Age (years)		
≤ 45	5	5
46–55	13	13
56–65	19	19
66–75	21	21
76–85	30	30
> 85	14	14
Domicile		
Outside Mueang district	77	75.5
Mueang district	22	21.6
Other provinces	3	2.9
Type of stroke		
Ischemic stroke	60	58.8
Hemorrhagic stroke	38	37.3
Transient ischemic attack	4	3.9
Onset after symptom to hospital		
Less than 6 hours	56	54.9
6 hours – 24 hours	26	25.5
More than 24 hours	20	19.6
Comorbidities		
Hypertension	55	53.9
Aphasia	38	37.3
Diabetes Mellitus type II	28	27.5
Heart disease	18	17.6
Bedridden	10	9.8
Chronic kidney disease	9	8.8
Complications		
Pneumonia (excluded TIA patients)	72	73.5
Cardiac Arrest	10	9.8
Renal complication	3	2.9
Pulmonary embolism	3	2.9
Length of stay		
Less than 3 days	42	41.2
3 days to 7 days	33	32.4
More than 7 days	27	26.5

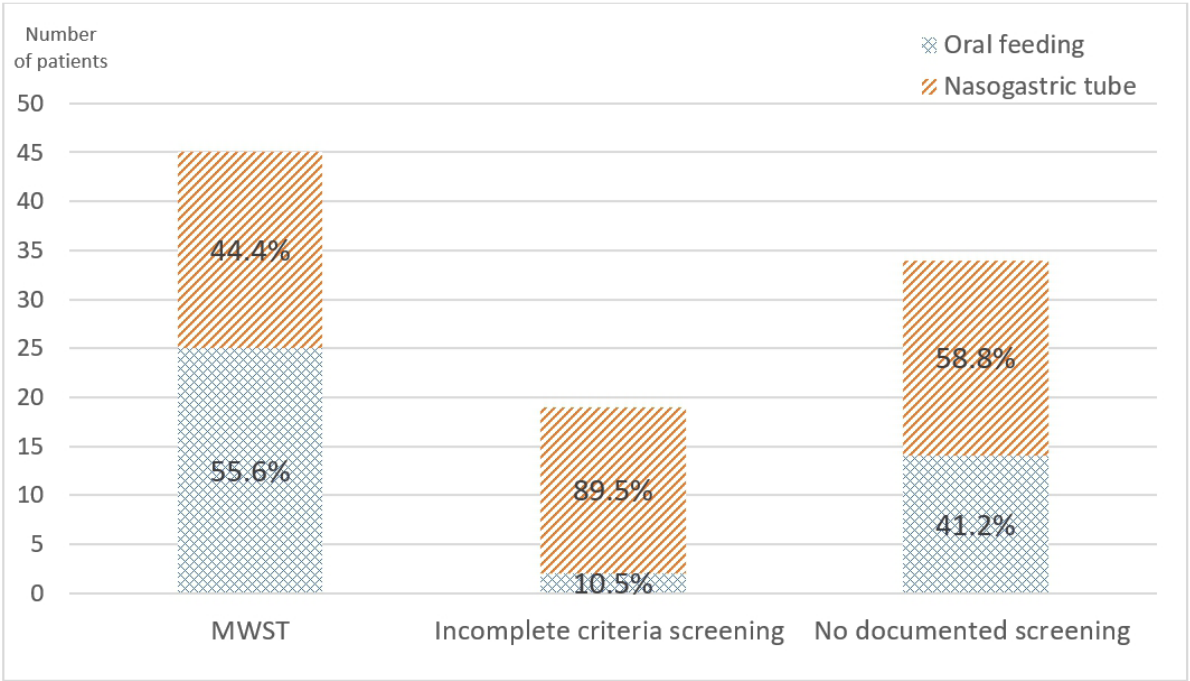
Table 2. *Development of pneumonia correlated with results of MWST*

MWST score	Total number of patients	Pneumonia complications (%)
1	13	10 (76.9%)
2	2	2 (100%)
3	5	5 (100%)
4	0	0
5	25	15 (60%)

Abbreviation: MWST = Modified Water Swallowing Test

A total of 57 patients were exclude in this analysis, of these, 19 were the patients who met the exclusion criteria, 4 were TIA patients, and 34 patients with no swallowing assessment record before starting oral food intake. Forty-five of 98 patients had been assessed by using MWST, 25 patients had MWST score 5 and had started oral eating, 20 patients that MWST score 1-4 and retain nasogastric tube for feeding as shown in Fig.1.and Fig. 2.

Figure 2. *Initial management of feeding in acute stroke patient*



Of 98 patients in the analysis, 57 patients (58.2%) had dysphagia and received nasogastric tube feed and only 3 patients (3 of 57 patients, 5.3%) were sent to the rehabilitation department to evaluate.

Incidence of pneumonia was 73.5% (72 of 98 patients) and commonly found during the 3–7 days after admission. In a group of patients who were screened by MWST, pneumonia was found in 85% (17 of 20 patients) of patients with MWST score 1–4 (failed) and 60% (15 of 25 patients) with MWST score 5 (passed).

Discussion

The incidence of stroke is commonly found in elderly patient[16, 17] while young patients (age < 45 years) found only 4.9%[5] but in some developing country stroke in young onset reach to 19–30 %[18]. Ischemic stroke has a higher incidence than hemorrhagic stroke and hypertension is a major risk factor of ischemic stroke due to atherosclerosis as studied by Nijasri C. Suwanwela[2] showed at 53%, as well as 53.9% in this study.

Our study found that only 45.9 % of stroke patients (45 of 98 patients) were evaluated by the MWST. All stroke patients were not screened even though many studies suggest the screening protocol before start eating may reduce the occurrence of aspirate pneumonia[19, 20].

Instrumental swallowing assessment that is widely accepted as standard is video fluoroscopy or modified barium swallow which can assess problems while swallowing according to the bolus flow, movement of muscle and relationship of the swallowing process with aspiration[19]. The disadvantage of video fluoroscopy examination is radiation exposed, complications during the examination due to varieties of foods to assess may provoke aspiration occurring, and it is not available for all stroke patients. The bedside dysphagia screening has a variety of methods that were developed such as Gugging swallowing screen (GUSS) and water swallowing tests. The limitation of clinical bedside screening was missing in detecting silent aspiration, high up to 40%[10]. Water swallowing test (WST) is a popular method since it is practically assessed aspiration while using the varied amount of water, such as 2, 3, 10, 30, 50 to 150 mL. Although a large amount of water swallow testing can easily see aspiration or swallowing disorder symptom, but it is a high risk to develop pneumonia as well[12]. Therefore, a proper screening test should be safe and effective. In addition, a bedside screening should be simple because the swallowing assessment in foreign countries is the role of speech–language pathologists, however, in some country including Thailand, it is the role of ward nurse and occupational therapist. Increasing awareness to assess swallowing problems before start feeding food per oral, monitoring throughout the hospital stay and collecting medical records are important to develop a better process of caring for stroke patients.

The pneumonia incidence of stroke patients in this study is up to 73.5%. Pneumonia occurred in a group that passed MWST or score 5 (15 cases) and a group that failed MWST or score 1–4 (17cases). Swallowing disorder usually occurred in the first 3–5 days during their hospital stay as with the previous study that has reported to be in the first 3 days at 42–67% and the incidences of pneumonia in the first 5 days at 19.5–42%[5]. Aspiration usually caused pneumonia in stroke patients. Although the early management is provided to prevent unsafe oral feeding to those who failed swallowing test, patients also

have coughs and pneumonia, therefore nasogastric tube feeding is unable to prevent the occurrence of pneumonia[21]. On the other hand, stroke patients who have passed swallowing tests also have a chance of developing pneumonia, so observation for aspiration while having a meal and observation for clinical changing after screening should be concerned. However, the use of MWST method is a screening with swallow only 3 mL of water to detect swallowing disorders, which may not be enough to stimulate swallowing or choking disorders in some patients. We recommend the combined clinical test for bedside screening and close observation of patients who eat meal would allow us to identify patients who are at risk of developing pneumonia. The results of the screening test help us identify the patients who should undergo further investigation with instruments such as video fluoroscopy or fiberoptic endoscopic examination of swallowing. Although dysphagia screening is recommended in clinical guidelines, However, there is still little cooperation in evaluating all stroke patients who meet criteria screening and refer for rehabilitation.

The incidence of pneumonia was found up to 73.5% in the stroke patients, even who had 5 of MWST score, we recommend that every stroke patients should be screened by the MWST for early detection of swallowing problems and further management, rehabilitation, prevention of pneumonia, and for studying an incidence of pneumonia in stroke patients. Based on these findings, acute stroke care is complex and required multidisciplinary teams. In this study, we select a screening method with good screening tools which has high sensitivity and specificity, and safety for the patients. The appropriate dietary modifications and good oral hygiene care are all important for the next step of caring, and therefore requires expertise and cooperation to reduce the impact that dysphagia has on stroke patients. Limitation of this study is that we only reviewed the assessment of dysphagia problems in stroke patients by using MWST method, which is evaluated by the stroke unit nurses. The implement strategies should be compared to rehabilitation physicians or occupational therapists to ensure reliable results and improve screening skills. Ultimately, screening results should be beneficial for further guidance to select the patients for instrumental investigation and proper management.

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