Predictors of Prolonged Dysphagia Following Acute Stroke

Thesis

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List of Abbreviations

ASHA	**American Speech and Hearing Association**
BA 44	**Broca's area .**
BOLD	**Blood-Oxygen-Level-Dependent**
CD	**Carotid Duplex.**
CNS	**Canadian Neurological Scale**
CPG	**Central pattern generator**
EMG	**Electromyography**
EMST	**Expiratory muscle strength training.**
FEES	**Fiberoptic endoscopic evaluation of swallowing.**
FEESST	**Fiberoptic endoscopic evaluation of swallowing with sensory testing.**
FDG	**Fluorodeoxyglucose**
fMRI	**Functional magnetic resonance imaging**
IOPI	**Iowa oral performance instrument .**
LAR	**laryngeal adductor reflex .**
LES	**Lower esophageal sphincter.**
LSVT	**Lee Silverman voice therapy.**
MEG	**Magnetoencephalography**
MBS	**Modified barium swallowing.**
MMASA	**Modified Mann assessment of swallowing ability.**
MOST	**Madison oral strengthening therapeutic device.**
NA	**Nucleus ambiguous**

NET	**Nasoenteric tubes.**
NG	**Nasogastric .**
NIHSS	**National Institutes of Health Stroke Scale**
NMES	**Neuromuscular electrical stimulation.**
NPO	**Non per os, nothing by mouth .**
NTS	**Nucleus tractus solitaries**
OPS	**Orpington Prognostic Scale**
OTs	**Occupational therapists**
PEG	**percutaneous endoscopic gastrostomy.**
PET	**positron emission topography**
PTs	**physiotherapists**
RDs	**Registered dietitians**
RNs	**Registered nurses**
RPNs	**Registered practical nurses**
rTMS	**Repetitive transcranial magnetic stimulation**
sEMG	**Surface electromyography .**
SLP	**Speech-language pathologist.**
SPSS	**Statistical package for scientific science.**
SQUID	**Superconducting quantum interference device**
SSA	**Standardized Swallowing Assessment**
tDCS	**Transcranial direct current stimulation**
TMS	**Transcranial magnetic stimulation**
TOMS	**Tongue force measurement system .**
TOR-BSST	**Toronto bedside swallowing screening test.**
UES	**Upper esophageal sphincter.**
VFSS	**Videofluorographic swallowing study.**

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Abstract

Background: Dysphagia following acute stroke can be a serious threat to one's health because of the risk of aspiration pneumonia, malnutrition, dehydration, weight loss, and airway obstruction. There is an evidence that early enteral feeding via percutaneous endoscopic gastrostomy (PEG) is both beneficial and safe. **Objectives:** To predict risk factors of prolonged dysphagia following acute stroke for proper management of similar cases. **Subjects and Methods:** This study was a prospective cohort study conducted on 113 patients with acute stroke admitted within 24 hours. Clinical findings and imaging results were prospectively collected, and subsequent progress was recorded. Subjects were divided into 3 groups for analysis: no dysphagia; transient dysphagia (≤14 days); or prolonged dysphagia (>14 days). Particular attention was paid to bulbar function. Stroke severity was assessed using the National Institutes of Health Stroke Scale on admission and on discharge. The water swallow test was performed to all patients who were able to attend sufficiently to follow the instructions. Modified Barium Swallow or Video-fluoroscopy test was done for some patients to detect the oropharyngeal dysphagia. **Results:** Significant associations for prolonged dysphagia were seen with large stroke, increased stroke severity, dysphasia and lesions of the frontal and insular cortex and presence of old vascular insult on brain imaging. **Conclusion:** These results indicated that it is potentially possible to identify those patients who have prolonged significant dysphagia following acute stroke at an early time point. This would allow the judicious use of early PEG to avoid aspiration pneumonia and for better nutrition.

Keywords: Acute stroke, dysphagia, risk factors, percutaneous endoscopic gastrostomy, aspiration pneumonia.

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Introduction

Dysphagia is a Greek word that means disordered eating. Dysphagia typically refers to difficulty in eating as a result of disruption in the swallowing process. Dysphagia can be a serious threat to one's health because of the risk of aspiration pneumonia, malnutrition, dehydration, weight loss, and airway obstruction **(Han *et al*., 2008)**.

Stroke is the leading cause of neurologic dysphagia. Approximately 51-73% of patients with stroke have dysphagia, which is the most significant risk factor for the development of pneumonia. This can also delay the patient's functional recovery **(Bussell *et al*., 2011).**

Swallowing is initiated by the cerebral cortex and effected by the brainstem swallowing center. Although not all brain injuries affect areas involved in steering the swallowing process, many brain injuries, such as from a stroke, disrupt the normal physiology of swallowing, leaving the airway vulnerable to the entry of food into the lungs (aspiration) **(Mann, 2002)**.

Pneumonia accounts for approximately 34% of all stroke-related deaths and is the third-highest cause of death during the first month after stroke, although not all these

pneumonias are caused by aspiration of food following attempted eating **(Roth, 1991*).*** Therefore, detecting and managing dysphagia as early as possible is critical among patients after stroke.

Oropharyngeal motor dysfunction is an important cause of swallowing disorder after stroke **(Daniels *et al*., 1998)** .In addition, it has been claimed that pharyngeal sensory impairment is common after acute stroke and that such impairment is associated with an increased risk of aspiration and aspiration pneumonia **(Kidd *et al.*, 1993)**. Recovery from dysphagia secondary to stroke is not guaranteed. As a result, a variety of treatments have been developed for improving stroke patient's ability to swallow safely, and perhaps even sufficiently to allow a return to completely normal eating and drinking.

The issue of identifying patients at risk from aspiration has been intensively investigated. Whilst often considered the gold standard, video-fluoroscopy has not found widespread acceptance in the routine assessment of patients following acute stroke **(Teasell *et al*., 1999*)***.

This is largely because a high proportion of acute stroke patients and elderly asymptomatic control **(Frederick *et al*., 1996)** can be demonstrated to have some

degree of aspiration and the correlation with risk of developing significant aspiration pneumonia is not clear. In contrast, a number of simple clinical assessments of swallowing function have been validated as predictors of aspiration. These have the advantages of being easy to perform in the emergency department, and are less invasive and cheaper **(Martino *et al.*, 2000)**.

An example is the water swallow test of 50–150 ml, which has been demonstrated to predict risk of aspiration with high sensitivity. The sensitivity of this test can be increased by careful assessment of bulbar function with abnormalities of pharyngeal sensation (but not the gag reflex) and reduced cough reflex **(Nakajoh *et al.*, 2000)** being particularly useful in detecting silent aspiration.

The early identification of those at risk of significant dysphagia and requiring nutritional support will permit the study of early nutritional supplementation via nasoenteric tubes (NET) or percutaneous gastrostomy (PEG). Whilst previous studies have looked at the natural history of dysphagia after acute stroke **(Wanklyn *et al.*, 1995)** predictive factors for prolonged dysphagia have not been specifically addressed. We had therefore, performed a prospective cohort study of patients admitted to the stroke

unit at the Ain shams specialized Hospital, looking specifically for factors, which might predict prolonged dysphagia.

Aim of the work

The aim of this study is to identify predictors of prolonged dysphagia following acute stroke for proper management of similar cases.

Anatomy

Swallowing is a complicated process that involves the oral cavity, pharynx, larynx and esophagus (Figure 1). This process is the product of a series of events that require an intact nervous system and adequate musculature for initiation, facilitation and conclusion of a safe swallow**.**

The oral cavity begins at the lips and includes the teeth, gums, tongue, hard palate and soft palate, the uvula (velum), faucial arches and cheek muscles. The oral and nasal cavities are connected at the back of the throat by a passage with a valving action that closes during swallowing. This valving action prevents food and liquid from entering the nasal cavity. Also, within the oral cavity are three pairs of large salivary glands: the parotid, submandibular, and sublingual glands. Saliva produced by these glands maintains oral moisture, reduces tooth decay, assists with digestion and neutralizes stomach acid **(Heart and Stroke Foundation of Ontario, 2006)**.