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Guideline of Videofluoroscopic Swallowing Study (VFSS) in Speech Therapy	Review Date	24/8/2024
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1.0 Objective

This guideline guides Speech Therapists in conducting Videofluoroscopic Swallowing Study (VFSS) for assessment and management of patients with oropharyngeal dysphagia.

2.0 Aims of Procedure

The aims of Videofluoroscopic Swallowing Study (VFSS) are:

- 2.1 To provide an objective and dynamic investigation of the anatomical and physiological aspects of oral, pharyngeal and upper esophageal phases of swallowing
- 2.2 To obtain high quality imaging for evaluation of swallowing difficulty
- 2.3 To identify the occurrence and degree of aspiration / penetration, and the corresponding airway protection integrity
- 2.4 To provide appropriate recommendations in mode of feeding to achieve optimal nutrition and hydration safely
- 2.5 To determine optimal food texture, fluid consistency and bolus volumes for safe swallow in oral feeding
- 2.6 To evaluate the applicability and effectiveness of therapeutic and compensatory swallowing strategies or techniques
- 2.7 To guide the need for further investigation

3.0 Indications for Procedure

The indications for conducting VFSS include:

- i. Suspected oropharyngeal stage of dysphagia
- ii. Suspected esophageal reflux to pharynx
- iii. Signs and symptoms that are inconsistent with bedside clinical findings
- iv. Un-explained history and cause of chest infection
- v. Suspected silent aspiration
- vi. Intolerance to endoscopic insertion necessary for Flexible Endoscopic Examination of Swallowing (FEES)
- vii. Documentation of changes in swallowing functions during rehabilitation
- viii. Determination of appropriate swallowing intervention strategies

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4.0 Contraindications for Procedure

The contraindications for conducting VFSS when the patient is:

- i. Medically unstable
- ii. Unable to cooperate or participate in an instrumental examination
- iii. At risk for x-ray exposure, like pregnancy
- iv. Not able to be adequately positioned for examination
- v. Having history of adverse physiological reaction to barium, iodinated or other contrast unless prior medical precautions have been given by concerned medical professionals
- vi. Suspected of having perforation of the gastrointestinal tract

5.0 Information to Patients and/ or Stakeholders

Before the conduction of VFSS, the following possible risks and complications should be communicated to the patients and/or stakeholders:

- 5.1 There is rare complication of allergy to barium
- 5.2 Aspiration of contrast medium into the lung especially in broncho-esophageal fistula and barium peritonitis from unsuspected perforation may happen
- 5.3 In view of theoretical risk of absorption of iodinated contrast medium into systemic circulation in VFSS, patient with allergy to iodinated contrast medium should be assessed by the referring clinician for steroid premedication as in the practice of intravenous iodinated contrast medium administration

6.0 Limitations of VFSS

Speech therapists should aware of the limitations of VFSS:

- 6.1 Time restraints due to radiation exposure
- 6.2 The procedure only allows sampling of swallowing function and may not be representative of patient's typical swallowing function during meal-time
- 6.3 Adequate amount of contrast is required for visualization of swallowing function
Addition of contrast may alter viscosity of the bolus
- 6.4 The test bolus with contrast during VFSS may not equate to the texture of real food taken during meal-time
- 6.5 Contrast material is an unnatural food bolus with potential refusal by patients

7.0 Personnel Involved

VFSS is encouraged to be conducted under management of a multidisciplinary team of professionals including:

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- i. Speech Therapist
- ii. Radiologist
- iii. Medical Officer
- iv. Radiographer
- v. Nurse / Supporting staff / Caregiver

In case where the Radiologist or the Medical Officer cannot be physically present during the VFSS procedure, the procedure will be carried out by the speech therapist and the radiographer with medical support in close proximity for emergency operation in accordance with locally agreed arrangement.

8.0 Preparation of Food and Fluid

Speech Therapist determines the food/fluid types, the volumes and the order of presentation for oral trials. Different food and fluid in different consistencies are mixed with a contrast agent to ensure radio-opacity for viewing bolus transfer.

Commonly utilized contrast agents include:

- i. Barium sulphate suspension which is generally used with patients at risk of aspiration as it is relatively benign if aspirated
- ii. Non-ionic, water-soluble radiographic contrast medium e.g. omnipaque

The use of barium in VFSS is to coat food / liquid bolus with concentration that is adequately opaque to be visible on the radiographic image, but not so concentrated that significant mucosal coating will occur. Jaffer et.al. (2015) suggested the concentration of barium to be in the range of 20-40% w/v. For infant and children, the contrast material used should be in accordance with the child's body built and developmental status.

9.0 VFSS Procedure

There are variabilities in the literature and in published protocols of VFSS. Therapists should determine appropriate local protocols. VFSS should always follow as systematic and structured a framework as possible to allow for comparison within and between patients. VFSS is a dynamic assessment and should be flexible to allow changes to protocol or framework dependent on patients' presentation or their responses to the evaluation.

10.0 Penetration-Aspiration Scale

Rosenbek et. al. (1996) 8-point Penetration-Aspiration Scale is recommended to be used to indicate the degree of laryngeal penetration and/or aspiration, which also reflects the severity of dysphagia (see Table I).

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11.0 Discontinuation of VFSS

The procedure should be ceased if there is evidence of:

- i. Respiratory compromise due to aspiration of food and/or fluid
- ii. Laryngospasm
- iii. Bronchospasm
- iv. Paroxysmal coughing
- v. Persistent food refusal
- vi. Deterioration in medical condition

12.0 Interpretation and documentation of VFSS

12.1 Interpretation of the VFSS

Interpretation of anatomy and physiology during the oral, pharyngeal and upper esophageal stages of swallowing should be conducted. Any impacts that food / fluid trials with compensatory strategies may have on swallow function should be determined.

12.2 Documentation of Result

The VFSS conducted should be documented in report that should include information on:

- i. Presence and impact of any anatomical abnormalities on swallowing function and safety
- ii. Details of the oral, pharyngeal and upper esophageal symptoms of dysphagia and the impact of physiological / dysfunctions on swallowing safety and efficiency
- iii. Patient's response and tolerance to VFSS (e.g. acceptance to oral trials, presence of fatigue during VFSS)
- iv. Details of consistencies tried, volumes consumed and the views in which the images are obtained
- v. Details on the timing, symmetry and flow of the bolus and the severity of the swallowing impairment with regard to presence / absence of laryngeal penetration, aspiration, pooling, airway protection and bolus transit. Rosenbek et.al (1996) Aspiration and Penetration Scale can be used for documentation on the level of aspiration and clearance ability.
- vi. Recommendations for optimal and safest mode of nutritional and hydration intake
- vii. Recommendations for posture, positioning, equipment, feeding utensils, compensatory strategies and rehabilitative techniques to enhance

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the safety and efficiency of swallowing

viii. Recommendations on the diet types and fluid consistencies that are safe to patient when oral feeding is allowed.

ix. Recommendations for referral(s) to other medical professionals if necessary

13.0 Referral to Other Professionals

Upon the completion of the VFSS procedure, the following professionals may be consulted for further management:

- i. Physiotherapists for chest physiotherapy
- ii. Medical professionals including Gastroenterologist, ENT surgeon, Neurologist and Respiratory Physician for further medical investigations

14.0 Education and Counseling

Speech Therapists should provide education to patients, caregivers and health professionals to ensure adequate understanding of the VFSS results and the subsequent dysphagia management plan for the patient.

15.0 Radiological Safety

Speech Therapists should be aware of the possible negative biological effects due to exposure to x-rays. In order to minimize the exposure to x-rays, the three cardinal radiation safety factors of time, distance and shielding should be considered:

15.1 Time

15.1.1 Fluoroscopy time typically should be kept as lowest as reasonably achievable for all candidates at all times during the procedure. Speech Therapist should coordinate with radiographer through implementation of well-planned and efficient VFSS procedure that keeps radiation exposure as low as reasonably achievable.

15.1.2 Implementing staff roster for exposure consideration

15.2 Distance

Speech Therapist or personnel involved should remain as far from the patient and x-ray tube as practical. The amount of radiation exposure one received is inversely related to the distance from the source.

15.3 Shielding

Speech Therapist and staff involved should wear appropriate shielding such

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as lead aprons, eye shields, thyroid shields, and lead gloves to decrease radiation exposure of vulnerable body organs.

15.4 Monitoring of Radiation Exposure

Speech Therapist and staff involved in feeding the patient are advised to wear a dosimetry badge under the apron. Involved personnel should not receive more than 20mSv/year (Radiation Ordinance, Cap. 303, Laws of Hong Kong, 2012).

15.4.1 Caution with Pregnancy

Alternative options of instrumental swallowing assessment should be recommended to pregnant patients. Staff or caregivers with pregnancy should not be involved in the procedure.

15.4.2 Acquisition (Frame) Rate and Pulse Rate

Steele (2015) mentioned that image acquisition rates of 30 images per second are likely to be optimal in terms of sensitivity for detection of penetration-aspiration.

16.0 Infection Control

Refer to Infection Control Guidelines for Speech Therapy, HKIST (2022) for details.

17.0 References

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Appendix I

Table I: Rosenbek et. al. (1996) 8-point Penetration-Aspiration Scale

Scale	Definition
1	Material does not enter airway
2	Material enters the airway, remains above the vocal folds, and is ejected from the airway
3	Material enters the airway, remains above the vocal folds, and is not ejected from the airway
4	Material enters the airway, contacts the vocal folds, and is ejected from the airway
5	Material enters the airway, contacts the vocal folds, and is not ejected from the airway
6	Materials enter the airway, pass below the vocal folds, and are ejected into the larynx or out of the airway
7	Material enters the airway, passes below the vocal folds, and is not ejected from the trachea despite effort
8	Material enters the airway, passes below the vocal folds, and no effort is made to eject