

# Determining Aspiration of Oral Secretions and the Potential Impact on Evaluation of Dysphagia and VAP in Patients With Tracheostomies Using an Automated Intermittent Subglottic Aspiration System

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## Introduction

Silent aspiration is a common occurrence in most patients with tracheostomy tubes (Ding & Logemann, 2005). A thorough assessment and evaluation must take place to examine all risk factors prior to patients' initiation of oral intake. This is done to reduce all likelihood of pulmonary complications that can arise from aspiration. Instrumental testing (FEES) may be the most objective and definitive assessment of swallow function (Ding & Logemann, 2005). However, bedside clinical assessment may be the only swallow evaluation many patients will receive in a long-term ventilator unit.

The Modified Evan's Blue Dye Test (MEBDT) was introduced in 1995 as a screening tool to detect aspiration of liquids and food, as well as saliva. Blue dye is added to a bolus of carrier liquid or food (e.g., applesauce), followed by serial suctioning of tracheal secretions. If there is blue dye present in the tracheal secretions, it is positive for aspiration. However, the absence of the blue dye in the tracheal secretions does not definitively indicate that there is no potential for aspiration of oral secretions, liquid or food in the future.

## MEBDT Methodology

- The first step in Modified Evan's Blue Dye Test (MEBDT), Respiratory Therapist suctions oral cavity and trachea.
- Respiratory Therapist then deflates the tracheostomy cuff.
- A teaspoon of applesauce (5 ml) is mixed with 0.5 ml of blue dye and placed in the patient's oral cavity by the Speech Pathologist.
- Patient's trachea is suctioned by the Respiratory Therapist immediately, then after 30 minutes, 60 minutes, and 120 minutes.

## MEBDT Concerns

- Deflating the tracheostomy cuff prior to the test flushes all secretions accumulated above the cuff into the sterile lower airway.
- Applesauce, due to its consistency, may not leak past deflated cuff in the time period allotted for suctioning.
- The Respiratory Therapist must suction thoroughly and per the timetable (immediately, 30, 60, 120 minutes).
- Absence of blue dye does not indicate patient is not aspirating liquid, food, or micro aspirating saliva.
- 4 out of 8 aspirations may not be detected by MEBDT (50%) (Brady, S., Hildner, C., et al, 1999).
- 67% identification of aspiration in patients with large amounts of aspiration (Donzelli, J., Brady, S., et al, 2001).

## MEBDT Accuracy Questioned

- Since its introduction, the accuracy of the MEBDT has consistently been questioned.
- (Brady, S., Hildner, C., et al, 1999) identified the likelihood of false negative results with MEBDT.
- Most studies report a 50% false negative error rate for the detection of true aspiration.
- The technique for MEBDT will vary depending upon protocol and institution.

## New and Non-invasive Screening Tool for Aspiration: Gentile Green Dye Test (GGDT)

An alternative new technique utilizes an automated intermittent subglottic aspiration system. The SIMEX System is FDA cleared and specifically approved for the removal of subglottic secretion drainage from above the ballooned cuff of tracheostomy and endotracheal tubes with an integrated suction port. In this novel application, the clinician places a few drops of green dye on the back of the tongue of the patient, then suctions secretions from above the ballooned cuff using the automated aspiration system. If green dye is detected in the disposal canister of the system, the presence of micro aspirated oral secretions is identified.

## GGDT Methodology

- Patient admitted to the ventilator unit.
- Respiratory Therapist changes tracheostomy tube to subglottic suction design.
- Patient is connected (within 2 hours of admission) to the SIMEX Automated Aspiration System at -150 mmHg/12-second duration/10-minute intervals.
- Within 24 hours, Speech Language Pathologist places 4 drops of green dye on patient's tongue.

- Automated subglottic aspiration system will suction micro-aspiration and green dye will be detected in the canister. See Figure 1.
- Day 2, Speech Language Pathologist mixes 0.5 ml of green dye with 15 ml applesauce.
- If aspiration occurs – subglottic aspiration system will have green dye in the canister. See Figure 1 and Figure 2.

## GGDT vs MEBDT

- GGDT eliminates the tracheal suction variable that makes the MEBDT questionable.
- GGDT is non-invasive – patient does not aspirate applesauce or other dye-carrying material.
- Tracheostomy cuff is not deflated – eliminating the risk of ventilator-associated pneumonia (VAP).

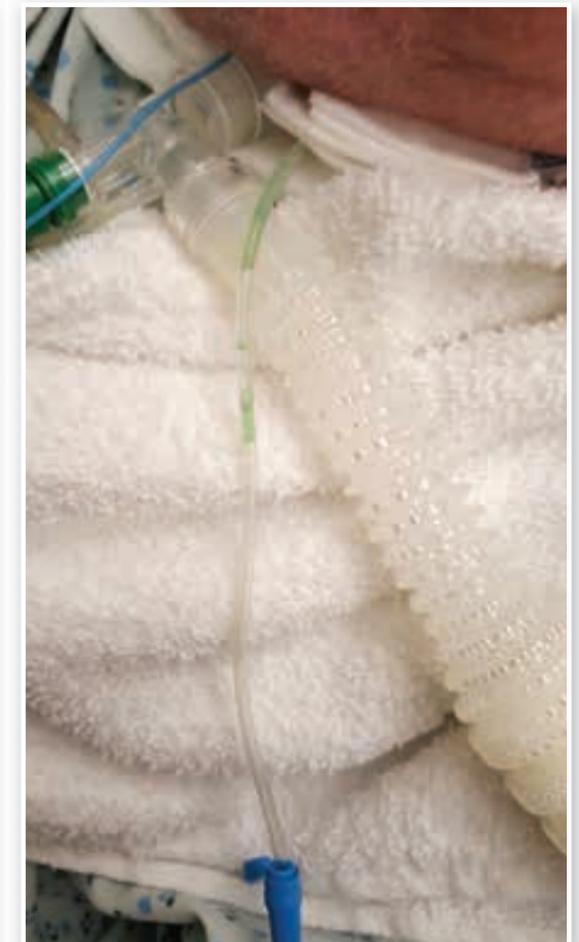
## Results

In a trial of 13 patients (mean age of cohort was 65 +/- 8 years – 8 women, 5 men) that were tracheostomized on mechanical ventilation and passed the MEBDT, micro aspiration of oral secretions was identified in 100% of these patients using the SIMEX aspiration system. These findings can predict the increased risk of saliva and oral secretion aspiration and potential VAP.

Applesauce/green dye was identified in the subglottic secretions of 9 of the 13 patients. In comparison, the MEBDT detected aspiration in 5 of the same 13 patient cohort. Follow up FEES studies confirmed that 9 of the 13 patients were positive for aspiration. The GGDT test had a 100% sensitivity and 100% specificity in detecting aspiration. The GGDT test also raises the clinical significance of the relationship between aspiration of oral secretions and the potential aspiration of food/liquid.



**FIGURE 1**  
Notice the green dye aspirated into the collection container of SIMEX Automated Intermittent Subglottic Aspiration System.



**FIGURE 2**  
Notice green dye is aspirated through the integrated suction port of the subglottic tracheal tube.

## Conclusion

The new technique which uses small amounts of green dye on back of the tongue in combination with the automated intermittent aspiration system offers a potentially safe, highly accurate, and well-tolerated way to diagnose aspiration of oral secretions and the increased risk of potential aspiration of food. The small patient size in the applesauce MEBDT – GGDT tests indicate that the suctioning of the subglottic space can significantly increase the accuracy of clinical dysphagia testing at bedside. Future study needs to be done to assess sensitivity and specificity of subglottic detection of aspirated food and liquid.

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## References

- <sup>1</sup>Brady, S., Hildner, C., Hutchins, B. (1999). Simulations video-fluoroscopic swallow study and modified Evans blue dye procedure: an evaluation of blue dye visualization in cases of known aspiration. *Dysphagia*, 14(3): 146-149.
- <sup>2</sup>Ding, R. & Logemann, J. (2005). Swallow physiology in patients with trach cuff inflated or deflated: A retrospective study. *Head and Neck*, 27(9): 809-813.
- <sup>3</sup>Donzelli, J., Brady, S., Wesling, M., Craney, M. (2001). Simultaneous modified Evans blue dye procedure and video nasal endoscopic evaluation of the swallow. *Laryngoscope*; 111(10): 1746-1750.