

# The Effect of Tracheostomy Speaking Valve use on Disordered Swallowing

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## Purpose:

Tracheostomy tubes have been suggested to cause diminished laryngeal elevation, loss of subglottic pressure, decreased sensation, and mechanical obstruction. Speaking Valves (SV) allow for improved communication and improvement in subglottic pressure. The precise effect of SV use on swallowing function is uncertain.

## Method(s):

Patients with a tracheostomy tube who presented with dysphagia between 01/10/07 and 11/20/10 were prospectively evaluated. All patients were naive to previous SV use. Participants were randomized to a SV or inner cannula control group. Patients underwent 4 days of identical swallowing therapy. The case group wore the SV for 45 minutes/day and during therapy. All patients were evaluated with endoscopic swallowing evaluation on Day 1 and Day 4. The treatment group had a SV placed during testing. The primary outcome measure was penetration aspiration scale (PAS). Secretion rating was utilized as a secondary measure. All outcomes were assessed from blinded digital recordings.

## Result(s):

Twenty-one patients were enrolled (11 SV/10 controls). The mean age of the entire cohort was 54 (+/- SD) yrs and 30% was female. There were no age or gender differences between groups ( $p>0.05$ ). No differences were noted in PAS or secretion rating between days 1 and 4 for the control group ( $p>0.05$ ). The PAS for the SV group improved from 3.67 to 1.75 ( $p<0.001$ ) and the secretion rating improved from 2.91 to 1.55 ( $p<0.001$ ).

## Conclusion:

A tracheostomy speaking valve may positively impact swallowing function and rehabilitation.

## **Effect of a tracheostomy speaking valve on breathing–swallowing interaction**

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### **Purpose:**

Expiratory flow towards the upper airway after swallowing serves to expel liquid or food particles misdirected towards the trachea during swallowing. However, expiration may not occur consistently after swallowing in tracheostomised patients with an open tracheostomy tube. We investigated the effect of a speaking valve (SV) on breathing-swallowing interactions and on the volume expelled through the upper airway after swallowing.

### **Methods:**

Eight tracheostomised neuromuscular patients who were able to breathe spontaneously were studied with and without an SV. Breathing-swallowing interactions were investigated by chin electromyography, cervical piezoelectric sensor, and nasal and tracheal flow recording. Three water-bolus sizes (5, 10, and 15 mL) were tested in random order.

### **Results:**

Swallowing characteristics and breathing-swallowing synchronisation were not influenced by SV use. However, expiratory flow towards the upper airway after swallowing was negligible without the SV and was restored by adding the SV.

### **Conclusion:**

In tracheostomised patients, protective expiration towards the upper airway after swallowing is restored by the use of an SV.

## **Effect of Passy-Muir Speaking Valve in Brain-injured Patients with Dysphagia: Two cases report**

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### **Abstract:**

It is well known that the brain-injured patients with tracheostomy is prone to frequent tracheopulmonary aspiration and dysphagia problems. We experienced two brain-injured patients with dysphagia, who revealed the improvement of clinical and videofluoroscopic parameters after application of Passy-Muir speaking valve (PMV 2000®, Passy-Muir Inc., USA). Two brain-injured patients had kept on nasogastric and tracheostomy tubes. After PMV application for 2 weeks, the frequency of aspiration decreased, sleep hygiene and emotional lability improved, and also videofluoroscopic parameters such as pharyngeal delay time, pharyngeal transit time, and epiglottic closure were improved. Eventually, they could be free from tracheostomy tubes within 1 month after PMV application.

## **Effect of the Passy-Muir tracheostomy speaking valve on pulmonary aspiration in adults**

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### **Purpose:**

We determined instances of aspiration in adults with tracheostomies and investigated the effect of the Passy-Muir tracheostomy speaking valve on occurrences of aspiration.

### **Methods:**

Adults with tracheostomies scheduled for videofluoroscopic swallowing examinations who met inclusion criteria were enrolled. According to study protocol, 6 presentations of thin liquids were recorded, 3 with and 3 without the Passy-Muir tracheostomy speaking valve. If a cuffed tube was present, the cuff was deflated fully for all presentations.

### **Results:**

Seven of 15 subjects aspirated material on 1 or more presentations of thin liquid. Five subjects aspirated material only with the Passy-Muir tracheostomy speaking valve off, whereas 2 subjects aspirated material with and without the valve. No subject aspirated material while the valve was on exclusively. Aspiration was significantly less frequent with the Passy-Muir tracheostomy speaking valve on than with it off.

### **Conclusions:**

Clinically unapparent aspiration occurs commonly in patients with tracheostomies. An expiratory occlusive valve can reduce, though not eliminate, occurrences of aspiration.

### **Clinical Implication:**

The benefit of the Passy-Muir tracheostomy speaking valve should be evaluated in selected patients who aspirate liquid.

## **Effect of the Passy-Muir Valve on Aspiration in Patients with Tracheostomy**

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### **Objective:**

To assess potential benefit of a Passy-Muir Speaking Valve (PMV) in decreasing aspiration in patients with a tracheostomy.

### **Background:**

Many patients with tracheostomy exhibit clinically significant aspiration. It has been previously noted that aspiration can often be reduced or eliminated by plugging or removing the tracheostomy tube. Some patients, however, do not tolerate removal or plugging of their tracheostomy tube, which then leads to persistent aspiration. We postulated that a one-way speaking valve may restore more normal subglottic and glottic air flow and reduce aspiration.

### **Methods:**

Alert patients with a tracheostomy and clinical evidence of aspiration were eligible for study. Eleven patients with tracheostomy and known aspiration were studied with a modified barium swallow. Radiographic examination was used to evaluate the presence and amount of aspiration while patients swallowed both with and without a PMV in place on their tracheostomy tube.

### **Results:**

Aspiration was reduced (or eliminated) during swallowing in all 11 patients when they wore a PMV, when compared to swallowing with an open (unvalved) tube. This improvement was achieved with liquids, semisolids, and pureed consistencies.

### **Conclusion:**

This study demonstrates that a Passy-Muir speaking valve facilitated swallow and reduced aspiration in patients with a tracheostomy and known aspiration.

## Effects of Cuff Deflation and One-Way Tracheostomy Speaking Valve Placement on Swallow Physiology

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### Abstract:

This study examined the effects of tracheostomy cuff deflation and one-way speaking valve placement on swallow physiology. Fourteen nonventilator-dependent patients completed videofluoroscopic swallow studies (VFSS) under three conditions: (1) cuff inflated, (2) cuff deflated, and (3) one-way valve in place. Four additional patients with cuffless tracheostomy tubes completed VFSS with and without the one-way valve in place. All swallows were analyzed for the severity of penetration/aspiration using an 8-point penetration-aspiration scale. Seven preselected swallow duration measures, extent of hyolaryngeal elevation and anterior excursion, and oropharyngeal residue were also determined. Scores on the penetration-aspiration scale were not significantly affected by cuff status, i.e., inflation or deflation. However, one-way valve placement significantly reduced scores on the penetration-aspiration scale for the liquid bolus. Patients who are unable to tolerate thin liquids may be able to safely take thin liquids when the valve is in place. However, one-way valve placement may not be beneficial for all patients. Clinicians who complete VFSS with tracheostomized patients should include several bolus presentations with a one-way speaking valve in place before making any decisions regarding the use of the valve as a means to reduce aspiration.

## **Guillain-Barre Syndrome and Disordered Swallowing**

Kazandjian M, Dikeman K

### **Abstract:**

Guillain-Barre syndrome (GBS) is an immune-based disorder of the peripheral nervous system. Cranial nerve involvement and dysphagia is experienced by individuals with clinical presentations of GBS. The neuromuscular deterioration can proceed quite rapidly, over a period of days or even hours. Speech and voice impairment accompanies some forms of GBS, beginning with a mild dysarthria, progressing in some cases to anarthria or total loss of speech production. Respiration and swallowing are commonly affected and account for much of the mortality with the disease. Long-term ventilator support and alternate feeding methods are often required when unresolved respiratory impairment occurs. The majority of patients with GBS will have a return in function and demonstrate full recovery. The role of the speech-language pathologist is instrumental in managing both swallowing and communication deficits and assisting recovery throughout the continuum of care.

## **Nutrition Management for the Patient Requiring Prolonged Mechanical Ventilation**

Doley J, Mallampalli A, Sandberg M

### **Abstract:**

Patients requiring prolonged mechanical ventilation are often medically complex and present with a wide range of pulmonary conditions, including neuromuscular diseases, chronic pulmonary diseases, and chronic critical illness. These patients present the nutrition support professional with many challenges. However, accurate nutrition assessment, timely and effective nutrition interventions, and careful monitoring will help patients meet their medical and nutrition goals.



## **Physiologic Effects of Open and Closed Tracheostomy Tubes on the Pharyngeal Swallow**

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### **Abstract:**

Studies linking aspiration and dysphagia to an open tracheostomy tube exemplify the possibility that the larynx may have an influence on oropharyngeal swallow function. Experiments addressing the effects of tracheostomy tube occlusion during the swallow have looked at the presence and severity of aspiration, but few have included measurements that capture the changes in swallowing physiology. Also, hypotheses for the importance of near-normal subglottic air pressure during the swallow have not been offered to date. As such, the aim of this study was to compare the depth of laryngeal penetration, bolus speed, and duration of pharyngeal muscle contraction during the swallow in individuals with tracheostomy tubes while their tubes were open and closed. The results of this series of experiments indicate that within the same tracheostomized patient, pharyngeal swallowing physiology is measurably different in the absence of subglottic air pressure (open tube) as compared to the closed tube condition.

## Reducing Pneumonia Risk Factors in Patients with Dysphagia Who Have A Tracheotomy: What Role Can SLPs Play?

Matthews CT, Coyle JL

### **Abstract:**

Part of being a competent speech-language pathologist is knowing about and using the evidence that supports or refutes what we do with our patients and clients. One service provided by SLPs—managing patients with dysphagia who have tracheostomy tubes—may be particularly challenging and therefore might be an especially important area in which to consult available evidence.

In addition to understanding the clinical considerations typical for all patients—such as medical comorbidities, current medical status, and mental state—an SLP needs to be aware of additional factors pertaining to a patient's tracheostomy. These factors include the presence of a cuff and the effects of cuff inflation status; the size of the tracheostomy tube in relation to the patient's probable tracheal diameter; whether mechanical ventilation is in use; the ventilation mode and patient progress toward weaning; the patient's tolerance of expiratory occlusion and success in establishing exhalation airflow to the larynx and oral-nasal exits; the patient's tolerance of a one-way speaking valve; and secretion management. As clinicians, how do we know which of these factors will positively or negatively affect a patient's swallowing function? How do we know whether these factors will result in impaired biomechanics that lead to aspiration and associated morbidity? How can we determine through assessment, and minimize through intervention, the likelihood of any adverse effects?

Which of our assessment procedures most accurately predicts or identifies aspiration? Multiple studies have demonstrated high rates of silent aspiration in patients breathing through a tracheostomy tube (Ding & Logemann, 2005; Davis et al., 2002; Davis et al., 2004; Elpern et al., 2000). Is stand-alone clinical testing sufficiently robust, how sensitive are these clinical screening tools in predicting aspiration, and should they stand alone as diagnostic studies for this population? Many argue that identification of aspiration is best accomplished by instrumental testing (e.g., Elpern et al., 2000; Ding & Logemann, 2005), but which instrumental test is superior?

## **Scintigraphic quantification of aspiration reduction with the Passy-Muir Valve**

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### **Abstract:**

The Passy-Muir "speaking" tracheostomy valve has been noted to aid in swallowing, based on videofluoroscopy to assess aspiration. In this study scintigraphy was used to quantify the amount of material aspirated.

Eleven patients were studied who currently had a tracheostomy in place and were either known to aspirate or were suspected of aspirating. Most were post-treatment head and neck cancer patients who were tumor free at the time of testing. Swallowing was evaluated using videofluoroscopy and scintigraphy. Videofluoroscopy was performed to assess anatomy and determine whether aspiration had occurred. Scintigraphic testing was then performed when the patient had the one-way valve on, and again with it off and tracheostomy open.

Following a swallow, the amount (%) of aspirate with the valve in place was found to be significantly less than with the tracheostomy open.

A one-way valve can be helpful in reducing aspiration in patients who are at risk for aspiration and who require that their tracheostomy be open.

## Speaking Valves and Swallowing

Debra M. Suiter

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### **Abstract:**

Do tracheostomy tubes cause dysphagia? Estimates of the number of individuals with tracheostomy and concomitant oropharyngeal dysphagia have been reported to be as high as 87% (Pannuzio, 1996). Whether there is a direct causal relationship between tracheostomy and dysphagia remains unclear, however, because results in the literature are equivocal. For further discussion of this topic, please see Bailey, this issue. In addition, many patients with tracheostomies have other medical factors, such as chronic obstructive pulmonary disease, that could predispose them to difficulty swallowing.

Regardless of whether tracheostomy tubes adversely affect swallowing, the fact remains that many individuals with tracheostomy tubes do aspirate. A number of options, including cuff deflation, tracheostomy tube occlusion, and oneway speaking valve placement, have been introduced to reduce or eliminate the risk of aspiration in this patient population.

## **Subglottic air pressure: a key component of swallowing efficiency**

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### **Abstract:**

The relationship between tracheostomy and swallowing dysfunction has been long recognized. Often this dysfunction is manifested by aspiration, for which a number of etiologic factors may be responsible. Disruption of glottic closure has been previously demonstrated in association with the presence of an indwelling tracheostomy tube. The plugging or removal of the tracheostomy tube, or the use of an expiratory air valve, has been demonstrated to decrease aspiration and improve swallowing function. Measurement of subglottic pressure through an indwelling tracheostomy tube during swallowing demonstrated pressure peaks occurring concomitant with swallowing and laryngeal elevation. This presentation will review the evidence supporting the role of subglottic pressure rise in swallowing efficiency. Current investigational activity will be reviewed, and new areas for study will be suggested.

## **Swallowing Evaluation and Ventilator Dependency— Considerations and Contemporary Approaches**

Lori M. Burkhead

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### **Abstract:**

With the advent of advanced life-saving practices, speech-language pathologists will continue to see a surge in the number of patients dependent on ventilators in both the acute and chronic phases of the health care continuum. Today, there are more individuals requiring ventilators, whether in the intensive care unit (ICU), in long-term care facilities, or in the community. In the past, it has been common to delay rehabilitation efforts in the ICU patient who requires a ventilator, based on the rationale that patients are too sick. This excuse no longer fits with contemporary knowledge regarding best practices in the ICU. Additionally, this argument is moot with regard to patients with diagnoses that will mandate long-term ventilator use. Our profession must understand and be able to address the unique concerns and needs regarding swallowing in those with either transient or chronic ventilator dependency.