Application of the Passy-Muir Swallowing and Speaking Valves

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David A. Muir
• 23 year-old ventilator dependent quadriplegic due to Muscular Dystrophy
• Developed PMV with help of his father
• David passed away in August 1990

Course Outline
• Clinical Complications of Tracheostomy
• Passy-Muir® valve Design
• Benefits of Passy-Muir valve
• Types of Passy-Muir valves
• Patient Assessment
• Application

Clinical Complications of Tracheostomy
• Proper Cuff Inflation
• Cuff Over-Inflation
  o Esophageal impingement
  o Reflux
  o Necrosis and Trauma
• Measure Cuff Pressures
• Lack of vocal production-communication
• Psychological-agony, fear, panic, frustration
• Decreased sense of smell/taste
• Tracheostomy and Aspiration
  o Does a cuff prevent aspiration?
  o Definition of aspiration
  o Incidence of aspiration
    ▪ 50% - 87% rate for trach and vent patients (Elpem et al., 1987, 1994, 2000; Tolep et al., 1996)
    ▪ 75% silent aspiration
• Review of Normal Swallow Physiology
• Swallowing Complications
  o Laryngeal Tethering
  o Decreased Sensation in the Oropharynx
  o Reduced Airway Closure
  o Reduced Subglottic Air Pressure
• Decreased Secretion Control
Removal of natural filtration and humidification system
- Decreases effectiveness of cough
- Cycle of irritation and secretion production
- Decreased Physiologic PEEP
  - Decreased gas exchange due to reduced surface area of alveoli
  - Poor oxygenation
  - Possible atelectasis

**Passy-Muir® Valve Design**
- Open position speaking valve
  - Air leak occurs with open position valves
  - Respiratory system is open (not closed), thus not providing clinical benefits available with closed position “no leak” valve design
  - Open system creates a potential for secretions to move through the tracheostomy tube and occlude an open position valve
- Biased Closed Position-No Leak Design
  - Patented design
  - Opens only during inspiration with minimal, less than .05cm H2O pressure
  - Closes automatically before the end of the inspiratory cycle/beginning of the expiratory cycle. Air is exhaled through the oronasopharynx.
  - No air leakage occurs through the PMV during exhalation
  - A column of air is trapped in the PMV and in the tracheostomy tube that inhibits secretions from entering the tube and occluding the valve
  - Restores a more normal “closed respiratory system” resulting in many clinical benefits
  - Safe to use with tracheostomized and ventilator dependent patients of all ages (birth to geriatrics)

**Clinical Benefits of Passy-Muir® valve**
- Restoration of voice (Leder, 1994)
  - 100% airflow through vocal tract on exhalation
  - Clearer voice with more normal phrasing, better vocal quality and increased volume
  - Finger occlusion is not convenient or hygienic and not as feasible with pediatrics or quadriplegics
  - Allows for clear, uninterrupted phonation and hands-free speech
  - Ventilator dependent patients can produce stronger, louder speech, longer sentences and a more normal speech pattern while using the PMV
- Improved sense of smell and taste (Lichtman, et al., 1995)
- Improved sense of smell by reestablishing airflow through the oral/nasal cavities
- Improved sense of smell may facilitate improved sense of taste which may increase appetite and caloric intake
- Improved appetite may lead to an improved nutritional status

  - Restores a “closed respiratory system”
  - Restores positive subglottic air pressure
  - Restores laryngeal/pharyngeal sensation
  - Reduces the “anchoring” effect of the tracheostomy tube due to the need for cuff deflation

- **Improved Secretion Control** (Lichtman, et al., 1995)
  - Stronger more effective cough with oral expectoration and improved swallowing
  - Restores airflow through upper airway and promotes evaporation of secretions
  - Facilitates sensation in oropharyngeal area
  - May reduce secretions and suctioning needs by restoring function of the bronchial hygiene system

- **Restored physiological PEEP** (Frey & Wood, 1991)
  - Improved gas exchange
  - Improved oxygen saturation levels
  - Decreased risk of atelectasis

  - Restoration of normal physiology
  - Utilization of expiratory muscles and improves strength
  - Accustomed to more normal breathing pattern
  - Improved assessment capabilities
  - Interim step in the decannulation process
  - Able to communicate
  - Develops confidence and motivation

- **Cost Savings** (HCUP 2006)
  - Reduction in tube feeding supplies and associated costs
  - Reduction in costs associated with treating aspiration pneumonia and ICU stay
  - Reduction in costs related to suctioning and supplies
  - Reduction in costs related to resources of staff
  - Reduced ventilator days and LOS
  - Care of patient with tracheostomy approximately $7000 per day
  - Passy-Muir Valve approximately $1 per day
• Improved Quality of Life
  o Ability to regain control through communication
  o Improved energy/well-being
  o Facilitates more active participation in life activities/socialization

Types of Passy-Muir® valves
• PMV ®2000 (clear)
  o Lower profile, lighter weight and smaller in size than the original design-PMV 005
  o Clear, less visible for ambulatory outpatient
  o Opens easier upon inspiration than the PMV 005 or PMV 007
  o Can be used in-line with flexible, rubber or silicone adapter
• PMV ®2001 (Purple Color™)
  o Identical to PMV 2000 except for color
  o Bright purple color to facilitate staff awareness and helps prevent valve loss
• PMV® Secure It®
  o Packaged for use with the PMV 2000, PMV 2001 and PMV 2020 Speaking Valves only
  o Attaches the valve to the tracheostomy tube tie to prevent valve loss
• PMA® 2000 Oxygen Adapter
  o Small, lightweight, sold separately
  o Allows for delivery of low flow supplemental oxygen up to 6 L/min.
  o Snaps onto the PMV 2000 and PMV 2001 only
  o O2 flow delivered in front of the intake side of the valve
  o Allows for improved mobility
• PMV® 007 (Aqua Color™)
  o Designed to fit in-line with standard, plastic, disposable ventilator tubing and adapters
  o Can be used on or off the ventilator
• Metal Tubes- PMV®2020 (clear)
  o For use with the Pilling Weck metal Jackson Improved tracheostomy tubes sizes 4-6 or equivalent when utilizing the PMA 2020-S Adapter.
• Patient Care Kit
  o Facilitates proper use and maintenance of PMV and continuity of patient care.

Patient Assessment
• Team Approach
  o Successful use of the PMV is facilitated by a team approach
  o Each discipline brings to the assessment phase a unique understanding of the issues involved in regards to their area of expertise
• Patient Selection
  o Awake, responsive, attempting to communicate
- Medically stable
- Able to tolerate cuff deflation
  - Vent status
  - Aspiration status
- Able to manage secretions
- Have a patent upper airway
- Factors Affecting Upper Airway Patency
  - Size of Tracheostomy Tube
  - Presence and Degree of Obstruction
  - Edema
  - Secretions
  - Foam-Filled Cuff contraindicated

**To Assess for Upper Airway Patency**
- Deflate cuff
- Ask patient to inhale
- Finger occlude and voice or cough on exhalation
- Use mirrors, cotton, feathers, whistles or bubbles to assist with the oral exhalation process.

**Application**
- Placement Guidelines
  - Patient education
  - Peer education
  - Patient position
  - Suctioning
  - Achieve complete cuff deflation
  - Use the warning label provided with packaging
- Baseline Measurements
  - Oxygenation
  - Vital Signs
  - Breath Sounds
  - Color
  - Work of Breathing
  - Patient Responsiveness
- Placement of Passy-Muir Valve
  - Gentle quarter turn twist while stabilizing the flange of tracheostomy tube
  - Oxygen can be delivered via T-piece, trach collar or PMA 2000 O2 adapter
  - Humidity can be provided with nonmedical heated humidity via trach collar or T-piece
  - Humidification does not affect the function of the valve
  - HMEs are low performing when used in conjunctions with the valve
  - Do not use PMV with medicated nebulizer treatments
Transitioning

- Some patients require a gradual transition to wearing the PMV and may first need to use it for short periods of time, gradually increasing use as tolerated
- Fear and anxiety about trying something new may require gradual use of the PMV, reassurance from the clinician, patient education and use of distraction techniques
- Reeducation to breathing through the upper airway

Troubleshooting

- If patient is unable to exhale adequately
  - “Whoosh” of air with removal of valve- air trapping
    - Check trach tube cuff to ensure complete deflation
    - Make sure the patient and trach tube are positioned appropriately
    - Re-suction orally and tracheally as needed
    - For some patients nasal suctioning may be indicated
    - Assess for change to cuffless trach tube if cuff is too bulky
    - Assess trach tube size for possible downsizing
    - Physician assessment for upper airway obstruction

Care, Cleaning and Lifetime of the Passy-Muir® Speaking Valves

- Swish in mild soapy warm water, rinse in clear water, allow to air dry
- Average lifetime of 2 months

Educational Opportunities

WEBINARS or SELF STUDY COURSES
Application of Passy-Muir® Swallowing and Speaking Valves
Interdisciplinary Tracheostomy Team: Where Do I Start?
Ventilator Basics for the Non-RT
Ventilator Application of the Passy-Muir Valve
Pediatric Tracheostomy and Use of the Passy-Muir Valve
Pediatric Ventilator Application of Passy-Muir Valve
Swallow Function: Passy-Muir Valve Use for Evaluation & Rehabilitation

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