Passy Muir Valve (PMV) use in the NICU

Melanie Stevens, MS/CCC-SLP
Jennifer Finch, MA/CCC-SLP
Nationwide Children's Hospital
Department of Speech Language Pathology

ABSTRACT

The presence of a tracheostomy tube can impair a child's ability to communicate and bond with caregivers. Earlier assessment and subsequent use of a Passy Muir Valve (PMV) may improve communication and psychosocial outcomes in these patients. While there is extensive literature on the use of PMV in adults, little is known about the effects of PMV use in the neonatal/pediatric population.

This poster describes a new protocol for assessing and implementing PMV use in the Neonatal Intensive Care Unit (NICU) at Nationwide Children's Hospital. Assessment of candidacy and readiness for a PMV, contraindications for use, and the potential benefits of the PMV are presented. Methods for trialing the PMV and assessing progression/improvement are described. A case example illustrates the use of the protocol including the PMV readiness assessment, the initial trials, and progression to full time PMV use during all waking hours. Future directions for research are also discussed.

BACKGROUND

Beginning in Fall 2008, Speech Language Pathologists along with an Ear, Nose an Throat (ENT) Nurse practitioner at Nationwide Children's Hospital NICU Bronchopulmonary Dysplasia unit began a more consistent assessment of patients for PMVs. In order to promote increased use of PMVs, a standard coordinated protocol was formally established in 2010. This protocol aims to ensure a consistent referral process for PMV readiness assessments, subsequent supervised PMV trials, and progression of PMV use. Given the medical complexity of this patient population, this protocol was developed as a part of a multidisciplinary team consisting of Neonatologists, Speech-Language Pathologists, Respiratory Therapists and an ENT Nurse Practitioner. Overall, by working together as a multidisciplinary team, the group strives to improve overall patient care and as a result has experienced an increase in referrals for assessment and use of PMVs in the past two years.

Summary of PMV use from Fall 2008 through September 2011:

- 27 total patients were assessed for readiness of a PMV, including children requiring ventilator support and/or direct tracheostomy collar
- 19 of the 27 patients were found to be viable PMV trial candidates
- All 19 trialed the PMV for a 4-5 day period with the Speech-Language Pathologist
- The results showed the PMV to be safe for use with these patients without direct complications from using the PMV
- Thus far the success of this protocol has provided these patients with the ability to produce vocalizations and potentially improve social interaction with caregivers

Passy Muir Valve™

Patient fit with PMV at 15 months of age following downsizing to smaller tracheostomy tube. Positive change in behavior with ability to vocalize observed.

Former 24 week preemies fit with inline PMV at approximately 4 months adjusted age (7 months chronological age). Patients continue to wear the PMV during the day with plans to decannulate.

Patient fit with inline PMV at approximately 5 months of age. Immediate vocalizations with mother observed at initial PMV assessment.

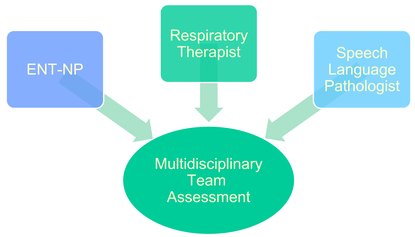
Protocol

Purpose: To establish a standard protocol for referral for evaluation of PMV readiness and use

Benefits of the PMV include, but are not limited to
- restoration of physiological Positive End Expiratory Pressure (PEEP)
- restoration of voice
- improved sense of smell and taste
- improved swallowing
- improved secretion management
- improved overall development and quality of life

Contraindications for PMV assessment
- severe airway obstruction
- vocal cord paralysis - adducted position
- severe neurological impairment
- inflated tracheostomy tube cuff of any kind
- foam-filled cuff
- severe risk for aspiration

Candidates for referral must meet the following criteria
- post-operative tracheotomy 7 days or greater
- medically stable
- awake and responsive
- patent upper airway
- reasonably able to manage oral secretions
- able to tolerate cuff deflation
- trach collar or the following ventilator settings:
  - Fraction of Inspired Oxygen (FiO_2) < 60%
  - PEEP ≤ 12



Respiratory Therapist
- Adjust and monitor ventilator equipment and cuff deflation (if needed)

ENT Nurse Practitioner
- Complete manometry testing to assess transtracheal pressures
- Target transtracheal pressures < 20cmH_20
- Manometry results > 20 cmH_20 require consideration of tracheostomy downsizing to be able to tolerate PMV

Speech Language Pathologist
- Assess vocal ability
- Assess management of secretions

Note: Manometry results > 20 cmH_20 does not automatically disqualify a patient from trialing the PMV. Medical information and clinical judgment is ultimately the deciding factor in trialing the PMV. All team members monitor vital signs (work of breathing (WOB), respiratory rate (RR), heart rate (HR), color, O_2 saturations).

PMV Trials/Wear Time Progression

- Initial PMV trials by SLP only – trials start with length of time worn during initial assessment and progress as tolerated over the 4-5 day trial period
- Trials will be done 4-5 times within a 7 day period with a goal to increase wear time as tolerated.
- Only caregivers/family members who have been educated and have demonstrated knowledge of the PMV can place the PMV on the patient during visitation
- Transition to caregiver and nursing staff with an emphasis on increasing wear time and using the valve in various contexts (therapies, feeding, cares, etc)

CASE EXAMPLE

Baby Boy

Medical History
- Born at 38 weeks gestation
- Tracheomalacia
- Bronchomalacia
- Tetralogy of Fallot
- Pulmonary artery conduit stenosis

2/10/10- Tracheostomy (cuffed trach required due to high pressure ventilation)
7/28/10- Speech Therapy initiated to address early communication skills
9/14/10- Successful cuff deflation trials initiated
9/30/10- Deflated cuff 24 hours/day initiated

10/15/10- **Passy Muir Valve readiness assessment**
SIMV/PS (Synchronized Intermittent Mandatory Ventilation/Pressure Support)
- set rate (breaths/min) 12
- pressure support (cmH_20) 18

PIP (Peak Inspiratory Pressure) 40
PEEP 10
FiO_2 25%
Expiratory pressures via manometry = 10 cmH_20
-Tolerated PMV for 20 minute trial with vocalizations

10/18/10 – **Week long PMV trials with Speech Therapy initiated**
– Tolerated 20 minute PMV trial with vocalizations
10/19/10 – Tolerated 25 minute PMV trial with vocalizations
10/20/10 – Tolerated 25 minute PMV trial with vocalizations
10/21/10 – Tolerated 25 minute PMV trial with vocalizations
** Week long PMV trials with Speech Therapy ended and twice daily PMV use initiated with nursing.*

Patient continued to use PMV through weaning from SIMV/PS to CPAP/PS to trach mist collar. At discharge patient wearing PMV during all waking hours .

FUTURE DIRECTIONS

Current Quality Improvement initiatives:
- Consistent application of the protocol in the NICU at Nationwide Children's Hospital
- Consistent documentation of PMV wear time by nursing staff
- Carryover of protocol to all inpatient units

Potential Research Topics:
- Effects of PMV use on caregiver/child bonding
- Effects of PMV use on ventilator weaning and length of hospital stay

KEY REFERENCES

1. Engleman , S. & Turnage-Carrier, C. (1997). Tolerance of the Passy-Muir Speaking Valve in Infants and Children Less than 2 Years of Age. *Pediatric Nursing*, *23 (6),* 571-573.
2. Hoffman, L, Bolton, J. & Ferry, S. (2008). Passy-Muir Speaking Valve Use in a Children's Hospital: An Interdisciplinary Approach. *Perspectives on Voice and Voice Disorders, 18,* 78-86.
3. Hull, E, Dumas, H, Crowley, R. & Kharasch, V. (2005). Tracheostomy Speaking Valves for Children: Tolerance and Clinical Benefits, *Pediatric Rehabilitation, 8(3),* 214-219.
4. Torres , L. & Sirbegovic, D. (2004).Clinical Benefits of the Passy-Muir Tracheostomy and Ventilator Speaking Valves in the NICU. *Neonatal Intensive Care,* 17, 4.
5. Passy-Muir, Incorporated

ACKNOWLEDGEMENTS

* Thanks to Rachel Brown, MD, Ed Shepherd, MD, Leslie Justice, RN, BS, CPNP, & Erin Geiger, BS/RRT-NPS for working with us to create a multidisciplinary team for earlier assessment of Passy Muir Valve use.

* A special thank you also to Linda Dean, RRT, and Julie Kobak, MA, CCC-SLP/L at Passy-Muir, Inc.