Ventilator Application of the Passy-Muir® Valve

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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
- Benefits of the Biased Closed Position “No Leak” Design
- Passy-Muir® Valve Assessment and Placement
- Ventilator Connections
- Cost Effectiveness of Passy-Muir Valve Use
- Case Studies

Benefits Review of the Biased Closed Position “No Leak” Passy-Muir® Valves
- Physiologic Benefits of Passy-Muir® Valve (Review)
  - 100% airflow through upper airway on exhalation
- Clinical Benefits Review
  - Restores Voice/Communication
  - Improves Swallowing
  - Promotes Weaning and Decannulation
  - Improves Secretion Management
  - May Decrease Risk of Aspiration
  - Restores Physiologic PEEP
  - Improves Olfaction

Passy-Muir® Valve Assessment and Placement-“Set Yourself and your Patient up for Success!”
- Patient Selection
  - Awake, alert attempting to communicate
  - Medically Stable
  - Able to tolerate cuff deflation
    - Ventilation status
    - Aspiration status
  - Able to manage secretions
  - Tube must be small enough to allow air to pass
  - Patient must have a patent upper airway
  - Can be placed 48-72 hours post tracheotomy
- Ventilation Criteria Suggestions
  - Patient on <60 FiO2
• PEEP requirements of <10 cm H2O
• PIP less than 40 cm H2O

Placements Guidelines
• Patient education
• Peer education – team approach!
• Body position and posture – semi-Fowler’s
• Position of head and neck
• Achieve cuff deflation – slowly! (Pulmonary Toilet)
• 100% Cuff Deflation is Mandatory

Tube Position is Important

Assessment Criteria
• Observe pre-cuff deflation PIP
• Observe pre-cuff deflation exhaled Vt
• Achieve cuff deflation – slowly over 5 minutes
• Look for 40 - 50% loss of exhaled Vt
• Look for significant drop in PIP
• A: WHAT DOES THIS TELL YOU?

Assessment Criteria
• A: This assessment is telling you your patient can exhale around the properly sized tracheostomy tube, and the airway above the cuff is most likely patent.

Assessment Criteria
• 100% Cuff Deflation
• Patient must be able to exhale past the tracheostomy tube and through upper airway
• Assess air leak/decreased ventilation
• Compensate with ventilator changes

Cuff Inflated-Closed Circuit
• Cuff Deflated-Open Circuit
• Passy-Muir® Valve In-line

Ventilator Adjustments

Ventilator Assessment and Adjustments
• PEEP On/Off
• Volume compensation during cuff deflation
  - Increase Vt in small increments to achieve pre-cuff deflation pressures (PIP)
• Use low pressure alarm as disconnect/indirect low exhaled Vt alarm (set above 10 cm H2O)
• Set high pressure limit appropriately (10 - 15 cm H2O above the PIP)
• Pressure versus flow trigger
• Pressure Support
  - Use E-Sense, inspiratory cycle off, or set I-time to time limit PS breath
• Pressure Control
  - Set I-Time
Consider NIPPV mode

Review
- Adjust PEEP
- Slow cuff deflation
- Monitor pressure/volume loss
- Place Passy-Muir® valve
- Compensate for volume/pressure loss
- Time limit PS breaths
- Set alarms appropriately

Humidification
- Use with heat/moisture exchanger (HME) is ineffective
- Use with heated humidified system
- Remove Passy-Muir® valve for medicated treatment

Ventilator Connections
- Ventilator Connections
- Patient Assessment
  - Monitor Baseline Parameters
    - Saturation
    - Heart Rate
    - Respiratory Rate
    - Work of Breathing (WOB)

Cost Effectiveness of Passy-Muir® Valve Use
- Cost Savings

Case Studies
- Case Study #1 Neuromuscular patient - Multiple Sclerosis (MS)
  - 32 yr old MS patient on Servo i
    - Ventilator Settings:
      - SIMV/PS
      - RR 8
      - Vt 600 cc (PIP 20 cm)
      - PEEP 5 cm
      - FiO₂ .28
      - PS 15 cm
    - #8 Shiley tracheostomy tube
- Step Through the Process
  - Educate patient and staff
  - Place warning labels
  - Check position of head and neck
  - Note PIP and exhaled Vt
  - Provide pulmonary toilet and oral care
  - SLOW cuff deflation
- Re-assess airflow for Vt and PIP changes
- **Cuff Deflation Assessment**
  - Exhaled Vt is now 500cc (was 600)
  - PIP is now 17 cm (was 20 cm)
  - Patient has poor cough
  - Patient is not making any sounds
  - Q: Would you place a Passy-Muir® valve?
- **A:** No, valve is not placed in-line
  - Q: Why not?
  - Q: What are your recommendations?
- **A:** Changed to #6 Shiley
  - Your new assessment now reveals
    - Exhaled Vt 200cc (was 600)
    - PIP is now 8 cm (was 20)
    - Patient is coughing
    - Patient is verbalizing
  - Q: Would you place a Passy-Muir® valve?
  - A: Yes
- **Troubleshooting**
  - The patient seems to be able to produce speech on inspiration and expiration
  - There is continuous flow in the circuit
  - Q: What two things should you troubleshoot?
  - A: PEEP setting
  - A: Time limit PS
    - E-Sense
    - Expiratory Sensitivity
    - Expiratory %
    - Inspiratory cycle off – (this option is on the Servo i)
    - Set an inspiratory time / time limit your PS breath
  - Consider NIV mode
- **Case Study #2 Failure to wean (FTW)**
- **65 yr old FTW on PB 840**
  - Ventilator Settings:
    - SIMV/PS
    - RR 6
    - Vt 700cc (PIP 32cm H2O)
    - PEEP 5cm H2O
    - F\text{O}_2 .40
    - PS 15cm H2O
    - Total RR is 30-32
  - 8 Shiley XLT for 2 months
- **Step Through the Process**
  - Educate patient and staff
- Place warning labels
- Check position of head and neck
- Note PIP and exhaled Vt
- Provide pulmonary toilet and oral care
- SLOW cuff deflation
- Re-assess airflow for Vt and PIP changes

Cuff Deflation Assessment
- Exhaled Vt is now 250cc (was 700)
- PIP is now 12 cm (was 32cm H2O)
- Patient has strong cough
- Patient is making good vocal sounds
- Q: Would you place a Passy-Muir® valve?
  - A: Yes, Passy-Muir® valve is now in-line

Q: What problems would you expect with the PB 840?
- A: Unable to silence circuit disconnect alarm
- PS breaths have extended
- I-times

Troubleshooting
- Patient RR climbs to 38 BPM quickly
- Q: What two things should you troubleshoot?
  - A:
    - Check trigger sensitivity
    - Consider increasing Vt to reach pre-cuff deflation PIP (this assures proper alveolar VE)
    - Time limit PS breath

Q: Why does NIV mode promote successful Passy-Muir® valve use?
- A:
  - Disconnect sensitivity automatically shuts off
  - Volume alarms default to off
  - Practitioner can time limit PS breaths
  - Practitioner must set low pressure alarm (set above 10cm H2O)
  - Practitioner should set high pressure alarm (set 10-15cm H2O above PIP)

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