Anesthesia Machine Workshop

James H. Philip, ME(E), MD, CCE
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James H. Philip, ME(E), MD, CCE

Anesthesiologist and Director Bioengineering
Department of Anesthesiology, Pain, and Peri-operative Medicine,
Brigham and Women’s Hospital

Medical Liaison for Anesthesia,
Department of Biomedical Engineering
Partners HealthCare System

Associate Professor of Anaesthesia
Harvard Medical School

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Anesthesia Intranet Site contains all

www.bwhanesthesia.org

Education

Anesthesia Technology

Everything

Today (2011-08-18):
Anesthesia Machine Workshop 2011
Aisys Pre-Use Check – Text and slideshow
Fabius Pre-use Check – Text and slideshow
Breathing Circuit Review
The Circle-Absorber System and Fresh Gas Flow

- **Exhaust**
- **Expired**
- **Sampled & measured I, E**
- **CO₂ Absorbant**
- **Ventilation Flow**
- **Inspired**
- **Fresh Gas Flow (FGF)**
- **200 mL/min**
OR Ventilators
Old fashioned
Uncompensated Bellows Movement

Gas Compression and tubing expansion decreased actual tidal volume.

Fresh gas flow (during inspiration) added to actual tidal volume.

Older Machines
Ohmeda Modulus 2
Draeger Narkomed
1998 - WYSIWYG  What You Set Is What You Get
Set Tidal Volume - patient receives what you set
Two ways to achieve this

GE - Fresh Gas Compensation
Active, feedback-control of inspired tidal volume

Draeger - Fresh Gas Decoupling
Passive separation of FGF during inspiration
Aestiva

GE – white with green trim to touch

Aisys
Exhaled tidal volume feedback

Bellows moves approximately set tidal volume
Exhaled volume is measured
Next and subsequent inspired bellows movement changes
Bellows volume changes
based on previous exhaled tidal volumes

SmartVent in GE  Aisys  and  Aestiva
GE Aestiva example of all modern GE models

Fresh Gas Compensation
Active, feedback control of inspired tidal volume

Pneumatic (oxygen)-driven bellows

Inspiratory and Expiratory Flow Sensor

Feedback from flow sensors to bellows drive

Bellows stops pushing when
Measured Inspired Tidal Volume = Set Inspired Tidal Volume

If you press the Flush button
Bellows stops
Next breaths are confused

GE has many alarms that stop ventilation
All GE models have similar differential-pressure flow sensor.
BTW, You only need to slide it out to here to zero the flow sensors
Flow sensors in manifold
Flow sensors in manifold

Reversed
GE  Variable-Orifice flow Sensor (VOS)

Accurate over a wide range of flow
Each one is calibrated in GE factory
Memory chip stores the calibration curve

Variable orifice
Variable-Orifice flow Sensor (VOS)

Accurate over a wide range of flow
Each one is calibrated in GE factory
Memory chip stores the calibration curve

This is what makes the SmartVent™ smart
This is GE’s core technology
Variable-Orifice flow Sensor (VOS)

Pressure Transducer

P1 P2

F

Flow

Accurate over a wide range of flow
Each one is calibrated in GE factory
Memory chip stores the calibration curve

Variable orifice

One drop of water will make this fail
Water Management is important

Use an HME or HMEFilter

Heat and Moisture Exchanger between patient and circuit
Empty Aisys water reservoir

Between cases
If full during a case
Unexpected tidal volume readings
Draeger Ventilation

Virtual Fabius www.simanest.org
Draeger Ventilation

Fresh Gas Flow Decoupling
Passive separation of FGF during inspiration
Tiro, Fabius, Apollo
Piston
Fresh Gas Flow decoupling

Piston pushes set volume into circuit and lungs
Fresh gas is stored in reservoir bag during inspiration
Piston takes first from reservoir bag
Piston takes second from exhaled gas
Reservoir bag moves with Mech Vent (V or P mode)
Several phases
Draeger Fabius, Tiro, Apollo
Draeger Circuit
Draeger Hot wire Anemometer is cooled by flow

Calibrated for heat conductivity.
User sets Desflurane Y/N

Fabius – Used to Display,
Expired tidal volume

Apollo – Sensor #2
Used to measure
and control
inspired tidal volume
Creates “Auto-Flow VV”
Same as GE PCVG
Implications of “Decoupling”

Collateral damage
Reservoir bag is in the circuit during ventilation
Adds a second sequential mixing chamber
Old gas stays in-play even when FGF is high
This does not matter much during induction
This matters a lot during emergence
In emergence we desire Inspired agent concentration = 0
Even with bag ventilation, expired gas contaminates inspired
Example
Fabius, End of case, VCV, FGF = 15 LPM
Inspired does not = setting

even with high FGF (12 LPM)
Draeger Circuit
Draeger has difficulty clearing the last bit of agent

Malignant Hyperthermia Preparation
Target is $F_{\text{I, Agent}} < 5$ ppm
Most ADSs require 10 minutes
Fabius and Apollo require > 1 hour
Inspired Charcoal agent absorber will overcome this
They are on order

Aisys Inspired = 0 by second breath
GE Circuit

Pneumatic bellows ventilator

Fresh gas
End of Breathing Circuit and Ventilators

Next – Questions and Answers
Finally – review of Pre-Use Check