Inhalant Anesthesia: From the Machine to the Brain

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1. Delivery system of inhalant anesthetics
2. Medical gas source
3. Anesthetic machine
4. Breathing system
5. Waste gas scavenging
6. Medical gas source
7. Gas pipeline system
8. Liquid oxygen
9. Manifolds of large oxygen tanks (G or H cylinders)
10. Station outlets are equipped with non-interchangeable gas specific connectors to connect the gas supply to an anesthetic machine
11. High pressure system
12. Individual oxygen cylinders (E cylinder) attached to an anesthetic machine
13. Cylinders are connected to the anesthetic machine via hanger yokes
14. Hanger yokes have a pin index safety system to ensure that only an oxygen cylinder can be secured to an oxygen hanger yoke
15. The E cylinders are also under high pressure.
16. Oxygen pressure regulator
17. The pressure regulator will reduce the pressure of the oxygen exiting the cylinder or station outlet to a constant pressure of approximately 50 psi
18. Produce a safe operating pressure, prevent flowmeter fluctuations as cylinders empty, and decrease the sensitivity of the flowmeter’s indicator to movements of the control knob
19. Decrease to pressure form the pipeline or cylinder to an operating level
20. Intermediate pressure system.
21. Flowmeter
22. To be read in either ml/min or L/min
23. Controls the rate that oxygen will be delivered and allows for precise control of oxygen delivery
24. Each flowmeter is comprised of a tube, an indicator, and a scale
25. Calibrated as a unit for 760mmHg and 20 degrees C (68 F), and should not be interchanged
26. The lowest mark on the scale is the first accurate reading
27. The float should be read at the top of the indicator, except for the ball float which is read at the diameter of the ball
28. Vaporizer
29. Designed to volatilize liquid anesthetics and to deliver clinically useful concentrations of anesthetic vapor using oxygen as the carrier gas
30. Precision vaporizers dilute the high concentration of anesthetic vapor from the vaporization chamber to a clinically usable, relatively safe concentration
31. Usually vaporizers-out-of-circle (VOC).
32. These vaporizers are agent specific, usually variable bypass, and the anesthetic concentration can be changed relatively quickly
33. Oxygen flush valve
34. Supplies high flow rates (35 to 75 L/min) to the common gas outlet
35. The flow bypasses the anesthetic vaporizer and, therefore, dilutes the anesthetic gas within the breathing system
36. It is possible to overpressurize the breathing system very quickly and should not be used with a non-rebreathing system
37. Common gas outlet
38. Will connect to the fresh gas inlet of the breathing circuit (non-rebreathing or rebreathing)
39. Fresh gas inlet
40. Oxygen and inhalant will enter the breathing system via the fresh gas inlet
41. Rebreathing or circle breathing systems
42. Deliver anesthetic and oxygen to the patient, remove carbon dioxide from the exhaled gases, and provide a means to ventilate the patient
43. The circle systems are the more complex of the two systems (more components) and use chemical absorbents to remove CO2 and return gases to the patient
44. All circle systems have the same basic components that are arranged to move gases (both inhaled and exhaled) in only one direction
45. Oxygen and inhalant enters the breathing system through the fresh gas inlet and flows to the inspiratory one-way valve
46. Valve is responsible for directing gases towards the patient on inspiration and aids in preventing rebreathing of gases
47. Most unidirectional valves have a dome and disc construction
48. The valves add to the resistance of breathing and need to be regularly inspected
49. Inspiratory limb of the breathing tubes
50. Corrugated plastic (to reduce the likelihood of kinks) and are flexible, low-resistance conduits between the Y-piece and the one-way valves
51. Although the tubes have a low resistance, they do still add resistance to the breathing system
52. They should have an internal diameter greater than the patient’s ET tube minimize the additional resistanc
53. Breathing tubes do not add to dead space if the one-way valves are fully functional
54. The breathing tube will then connect to the Y-piece
55. Y-piece
56. Connects the endotracheal tube connector to the breathing tubes
57. Will contribute to mechanical dead space
58. Expiratory limb of the breathing tubes
59. Expiratory unidirectional valve
60. Adjustable pressure limiting valve (APL) or pop-off valve
61. The APL valve vents gases to the waste gas scavenging system to prevent the buildup of pressure and allows for rapid elimination of anesthetics from the system
62. The scavenging system should safely remove vented inhalants as to not contaminate the workplace
63. Should vent gases at a pressure of 1-2 cm H2O when fully opened, and it should remain open except during positive pressure ventilation
64. Reservoir bag is located in conjunction with the APL valve
65. The bag provides a reservoir tidal volume for the patient and should be approximately 6 times the patient’s tidal volume
66. When the pop-off is closed, the reservoir bag allows for assisted ventilation
67. Pressure manometer
68. Positioned on top of the CO2 absorber - should be used when giving a breath to ensure excessive pressure is not generated within the breathing system
69. CO2 absorber
70. The CO2 absorber’s function is to eliminate CO2 from the exhaled gases so that no CO2 may circulate back to the patient
71. The CO2 is eliminated through a chemical reaction that causes the absorber granules to change color and produce heat
72. Canister should be warm to the touch if the granules are working
73. The airspace between the CO2 granules (roughly 50% of the canister’s volume) should be greater than the patient’s tidal volume
74. Any gases passing through the absorber will combine with gases from the fresh gas inlet and be re-circulated back to the patient
75. Non-rebreathing or non-circle systems
76. Deliver anesthetic and oxygen to the patient, remove carbon dioxide from the exhaled gases, and provide a means to ventilate the patient
77. Mapleson systems
78. Eliminates all exhaled gases from the breathing circuit and does not make use of a CO2 absorber
79. Compared to the circle system, a non-rebreathing system has less resistance to breathing, allows for rapid alterations in anesthetic concentrations, is lightweight, and the system is inexpensive
80. Its disadvantages are that, although the equipment is inexpensive, it is more expensive to use due to higher gas flow rates and a grater loss of heat and humidity
81. The non-rebreathing systems use high fresh gas flow rates to flush exhaled gases from the system
82. There are no one-way valves or absorbers with the non-rebreathing systems
83. An APL valve and scavenger are used with these system
84. Inhalants to the brain
85. Inhalant anesthetics are drugs that are inhaled into the respiratory system of the patient in the form of vapors or gases
86. To produce their effects, they must be absorbed from the alveoli of the lungs into the blood stream and carried by the blood to the brain of the patient
87. The reverse will be true when an animal is recovering from an inhalant anesthetic