mindray animal care mindvet academy

MindVet Journal

Practical Veterinary SpO_2 Monitoring Basics

READ VITAL SIGNS Vol.1

LEARNING OUTCOMES

1. What is SpO_2 2. Clinical Significance of SpO_2 3. Low SpO_2 Causes 4. How to Improve Patient Oxygen Saturation Level

Concepts

SpO_2, also known as oxygen saturation, is a measure of the amount of oxygen-carrying hemoglobin in the blood relative to the total amount of hemoglobin.

PO_2 (partial pressure of oxygen) reflects the amount of oxygen gas dissolved in the blood.

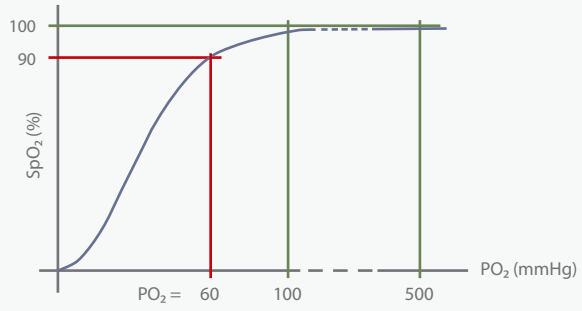

Figure 1: Oxygen Dissociation Curve

When SpO_2 drops to 90% or even below this, "free" O_2 will soon be not enough for proper metabolism.

PI (Perfusion Index) is the ratio of the pulsatile blood flow to the non-pulsatile static blood flow in **a patient's peripheral tissue**. The "common sense" is higher blood flow of the tissue leads to higher perfusion index.

Clinical Significance

Improve the safety of anesthesia

An immediate evaluation of patient oxygen saturation level is available. Veterinary professionals could detect and correct hypoxemia as soon as possible.

Reduce the risk of death after surgery

Providing continuous SpO_2 monitoring for patients after surgery, timely detection and intervene in cases of low blood oxygen.

Prevent or reduce fatalities in emergency cases

For some critically ill patients, continuous blood oxygen monitoring should be performed on the patients as soon as possible after admission to detect the decline in blood oxygen saturation, effectively preventing or reducing accidental deaths during emergency.

Oxygen Saturation (%)	Significance
98-99	Reassurance
≤95	Significant decrease in free oxygen content in animal blood
≤90	Low free oxygen content in animal blood
≤70	Life threatening

Low SpO_2 Causes and How to Improve Patient Oxygen Saturation Level

Improving patient oxygen saturation level should be based on individual differences, medication, medical history, and other parameters.

1 SpO_2 drops below 90%: When PI < 1%

Adjust the location of the oximeter probe since inadequate blood flow may happen to the tissue that is clamped by the probe.

Tips

During feline SpO_2 monitoring, it is more likely to face difficulties from signal loss or measurement error in veterinary daily practice. One of the reasons is that local hypoperfusion is more likely happen in cats and other small and lightweight animals. Therefore, an animal monitor with great anti low perfusion performance is essential!

In addition, the probe is also one of the key factors affecting the stability and accuracy of SpO_2 data. Excessive clamping force can lead to poor local perfusion, but too light clamping force can easily cause detachment, which can affect monitoring.

SpO_2 clip sensor for animals

Provide different size clip according to the measurement site

Round clamping surface and non-slip design, maintain proper clamping force while ensuring it will not fall off and improve comfort

SpO_2 is still 90% after adjusting the location of the oximeter probe:

2 $SpO_2 \leq 90\%$, $EtCO_2 > 50$ mmHg, with decreased respiratory rates and decreased tidal volume:

1. Connect the anesthetized patient to the ventilator and put him on Volume Control Mode (VCV).

2. Set respiratory rate to 20 per minute, Tidal Volume to 15ml/kg, Peak Airway Pressure to 20 cmH_2O and continuously ventilate the patient for 3-5 minutes.

3. During mechanical ventilation, the depth of anesthesia, SpO_2 and $EtCO_2$ should be monitored closely. Inhalational agent concentration should be adjusted to match the desired anesthetic depth of the patient.

4. If SpO_2 increases to above 95%, mechanical ventilation should be continued until the end of anesthesia. If SpO_2 doesn't change or decrease, the anesthetist needs to further analyze and exam the patient as below.

3 $SpO_2 < 90\%$ and mechanical ventilation doesn't solve it:

Pulmonary Perfusion Decrease

Evaluate the patient's blood pressure, $EtCO_2$, palpebral reflex and pupillary light reflex.

If mean arterial pressure < 45 mmHg, $EtCO_2 < 20$ mmHg, central eye position with both negative palpebral reflex and pupillary light reflex, the patient is highly possible to have cardiovascular system dysfunction. The vaporizer should be adjusted immediately.

If the patient is bradycardic, inotrope can be considered (atropine, dopamine, dobutamine).

If the patient's heart rate is normal or slightly higher than normal, fluid therapy can be considered (isotonic crystalloid or isotonic colloid).

Systemic Oxygen Consumption Increase

Evaluate the patient's heart rate, body temperature and $EtCO_2$ (highly unlikely).

If the patient is tachycardic, hyperthermic (>39.5℃), and $EtCO_2 > 55$ mmHg, the metabolism rate is likely to be high. High metabolism rate may lead to SpO_2 decrease (however, the possibility of this scenario is really low).

If the patient is malignant hyperthermic, vaporizer should be turned off immediately. Oxygen should be given to the patient through mechanical ventilation. Dantrolene can be used if the patient has significantly increased muscle tone. Enema can be performed when patient temperature goes above 40.5℃.

Gas Exchange Deficiency

$EtCO_2 > 55$ mmHg or $EtCO_2 < 20$ mmHg, lung auscultation and thoracic X-Ray can quickly indicate pulmonary edema.

Once pulmonary edema is confirmed, vaporizer should be turned off immediately. Oxygen should be given to the patient through mechanical ventilation. Furosemide should be used.

Urinary catheter can be placed if needed.

The cause of pulmonary edema should be found and further treatment will be determined according to the finding.

**For ePM series veterinary monitor: Mindray supports Masimo SpO_2 technology. Please contact Masimo directly to purchase accessories. For more information please visit " https: // www.masimo.com/ "*