Detection of SpO_2 in Patients with Extremely Low Cardiac Output or Cardiac Standstill.

FIRST ISSUE

Sensitivity of Pulse Oximeter system during extremely low local perfusion: Attempts have been made to maximize sensitivity for detecting pulsation and SpO_2 values in patients suffering from extremely low cardiac output and/or low local perfusion levels. Masimo has designed its standard technology to read perfusion levels at least 10 fold lower than conventional pulse oximeters.[1-2] In addition, Masimo has given clinicians the opportunity to select a level of even greater sensitivity (MAX sensitivity), not previously available with pulse oximeters. To obtain these levels of increased sensitivity, the system makes every effort to seek out a pulsation no matter how small the signal may be. An important clinical advantage of increased sensitivity is that the Masimo pulse oximeter provides valuable information (when other pulse oximeters can not) in critical situations where very low perfusion can occur, such as ICU, Trauma, Cardio-Pulmonary Bypass and, resuscitation.[3-9] The improved low perfusion capabilities of Masimo SET technology in the Radical pulse oximeter have been shown to be capable of monitoring SpO_2 and PR during extremely low perfusion and in fact, have been reported to correctly monitor chest compression during resuscitation in neonatal patients.[9] There is an important trade off for this increased sensitivity. When increasing system sensitivity, there is a small loss of specificity. For example, when selecting MAX sensitivity, there is the small potential for a short delay in the "sensor off" warning to activate when that condition exists.

It is important to note that even during cases of extremely low perfusion, the Masimo Radical oximeter reports the Perfusion Index value. This is a reliable indication of the level of perfusion at the monitoring site. When the Perfusion Index is quite low, the reliability of the monitoring site/situation should be evaluated. This is especially important whenever the "Low Perfusion" message is flashing.

SECOND ISSUE

The difference between arterial pulsation and electrical cardiac activity: Normally, this is important to consider when observing the difference in pulse rate versus heart rate in the case of electrical-mechanical dissociation. This is a condition when the heart continues to produce an electrical beat but does not pump any blood; in other words, it does not produce a pulsation. This can occur for a variety of reasons including the situation of very low blood volume. When there is no blood to pump, the heart can still have electrical activity. The case of detected pulsations without electrical activity is somewhat uncommon but does occur. Most commonly, this occurs when patients are receiving mechanical ventilatory support. The positive pressure exerted by the mechanical ventilator (to cause a breath) results in an increased pressure within the patient's chest. This pressure within the chest cycles up and down with each breath and is transmitted to the vascular system. In patients with very low blood volume or with an absent heart rate, this cycling of pressure can be detected as a pulsation. This is frequently seen on arterial blood pressure tracings of critically ill ICU patients and is referred to as the "delta up/delta down phenomena."

THIRD ISSUE

The level of SpO_2 in a dying patient: This is somewhat variable and depends on the cause of death and the clinical treatment the patient is receiving at the time of death. However, it is quite possible for a dying/dead patient to have a high SpO_2 value. This is the case when peripheral oxygen consumption is quite low, resulting in an increased mixed venous saturation. If extraction is very low and the patient is still receiving oxygen therapy, it is easily possible for the patient to have a high SpO_2 value.

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