Neonatal-pediatric application of transcutaneous pO_2/pCO_2 monitoring

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The application of transcutaneous pO_2/pCO_2 monitoring is essential in optimizing the ventilatory management of critically ill newborns. Application areas include high-frequency oscillatory ventilation initiation, transitioning modes of ventilation, and inter-facility transport.

In my experience, the transcutaneous pO_2/pCO_2 monitor is valuable in a variety of clinical situations that demand close observation by the healthcare practitioner of the ventilatory needs of the patient. There are at least three areas of application for transcutaneous monitoring in the neonatal-pediatric population:

- High-Frequency Oscillatory Ventilation (HFOV) initiation
- Transitioning modes of ventilation
- Inter-facility transport

A prime example of a clinical situation that demands close observation by the healthcare practitioner is an infant that requires HFOV. The ability to monitor tcpCO_2 while initiating HFOV is crucial. Adjusting the amplitude or Hz setting during the initiation of HFOV by monitoring tcpCO_2 is essential in decreasing the incidence of acute lung injury and potential neurological injury caused by lung overdistension.

Manipulating the HFOV settings by utilizing a transcutaneous monitor allows the practitioner to maintain the pCO_2 levels of a patient within a designated range in an efficient manner without waiting for a blood gas result [1]. Implementing transcutaneous monitoring as a standard of practice during the initiation of HFOV for both neonatal and pediatric patients promotes a strategy that protects the lung from the problems associated with barotrauma.

Transitioning a patient between modes of ventilation is another example where the transcutaneous monitor can be beneficial. Infants and children that initially require

HFOV will generally reach a point in their hospital course where they will need to transition to some form of conventional ventilation. The ability to fine-tune or make small changes on the conventional ventilator such as rate, peak pressure, or tidal volume during the transition phase by monitoring tcpCO_2 allows the practitioner to increase the likelihood that the patient will tolerate the change successfully and avoid the problems associated with hyperventilation or hypoventilation.

Another area where the trans-cutaneous monitor has been beneficial is inter-facility transport. Infants with the diagnosis of Persistent Pulmonary Hypertension of the Newborn (PPHN) on Inhaled Nitric Oxide (INO) therapy that require inter-facility transport can be one of the most challenging and difficult patients to transport.

The ability to monitor tcpO_2/tcpCO_2 levels in critically ill infants during transport allows the transport team to carefully observe the ventilatory status of the infant and intervene appropriately based upon the transcutaneous pO_2/pCO_2 values. In my experience, implementing transcutaneous pO_2/pCO_2 as a standard of practice during inter-facility transport of critically ill newborns promotes safety and efficiency in transport.

References

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