Case Report: Thermal injury from a pulse oximeter

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Abstract: Pulse oximeter monitoring of arterial haemoglobin saturation is now standard practice in most hospital settings. Reports of medical complications arising from using this device are rare. We present a case of a full thickness burn arising in a 17-month-old patient, which required further therapy for resolution.

Case: A 17-month-old child was admitted for tetralogy of Fallot and underwent cardiac surgery. The procedure itself was uneventful. She was transferred postoperatively to the paediatric intensive care unit for routine monitoring. The child developed status epilepticus and this caused the pulse oximeter probe to keep falling off the child’s foot. In an attempt to remedy this it was taped on. Two days later on removal of the pulse oximeter, a deep wound was noted. It was then reviewed by the Burns Team, who assessed it as a full thickness burn approximately 5mm in diameter. It was dressed with Silvazine® and healed in approximately one month with minimal scarring. The brand of pulse oximeter used was the Datex Ohmeda Dxt1® with a disposable Ohmeda Compatible probe.

Discussion: A safety study by Greenhalgh et al., 2004 suggests that pulse oximetry probes can be considered safe up to a temperature of 43°C for 8 hours on well-perfused skin. Reports of medical complications arising from using this device are rare. Previous burns due to pulse oximeters reported in the literature have mostly occurred due to improper use of the device or device malfunction5-8.

Neonates and infants comprise the majority of cases reported in a safety advisory review in the Unites States 50% of cases of pulse oximeter thermal injury were in neonates, 25% between 13-24 months and 25% over 80 years of age10. Furthermore, critically ill patients with poor perfusion and likely longer monitoring times are jeopardised by their reduced ability to dissipate heat. Greenhalgh et al., 2004 suggests hypothermia, shock and ischaemia to be contributing factors to risk of thermal injury with pulse oximetry. Taping of the probe to an extremity such as in this case can decrease blood flow to the area2. The combination of pressure and temperature increases the risk of burns due to the reduced ability to dissipate the heat generated. Duration of monitoring also increases risk of injury11,12. Both of these factors were seen in the case we present here and were likely contributing factors to the resulting burn.

Conclusion: Pulse oximeter monitoring of arterial haemoglobin saturation is now standard practice in most hospital settings. Although rare, serious burn injuries secondary to pulse oximetry have been reported. Health care providers need to be aware of the rare but real risks posed by the use of pulse oximetry, especially in the paediatric population. We suggest the following precautions in the use of pulse oximetry (see Table 1).

How do they Work? Pulse oximeters consist of a base unit with a microprocessor and an electrode sensor that is attached to an extremity or ear. They rely on the spectrophotometric analysis of light to assess the oxygen saturation of hemoglobin. The microprocessor isolates the pulsatile component of blood flow (estimating heart rate) and this directs attention towards arterial flow. The probe contains diodes on one side and photodiodes on the other. Two diodes emit light at 600nm (red) and 940nm (infrared) wavelengths, corresponding to the absorption spectrum of oxygen and deoxygenated hemoglobin, respectively. Photodiodes on the opposite side of the translucent extremity record the amount of each wavelength absorbed and this information is passed to a microprocessor which calculates the percentage of oxygenated hemoglobin in arterial blood.

How pulse oximeters work...