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Burn, Erosion, and "Sun"tan With the Use of Pulse Oximetry in Infants

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The less-invasive nature of pulse oximetry has contributed greatly to monitoring in anesthesia and critical care medicine. We have been using various pulse oximeters for the past 8 yr in children, and have encountered three complications, as described below.

CASE REPORTS

Case 1. A 3-month-old infant was admitted for elective repair of a right inguinal hernia. A pulse oximeter (Nellcor® N-100 probe I-25, Nellcor) was placed on the left great toe to collect normal baseline data the night before surgery. A nurse removed the probe 6 h later because the infant had been unusually irritable. She found a localized skin burn underneath the photo-transmitter side of the probe. The skin lesion turned into a blister (fig. 1).

Upon investigation, the surface temperature of the photo-transmitter side of this particular probe showed over 70° C. The overheating was not solved by using another new probe. The device was returned to the manufacturer for repair. The skin burn healed without any sequelae.

Case 2. A 4-month-old infant was paralyzed and ventilation controlled following repair of congenital tracheal stenosis. The ear probe of a pulse oximeter (Biox III®, Ohmeda) was placed on the upper part of the left antihelix. Because of the stable readings, the probe was left in place for over 48 h without reclipping or relocating. An area of mild skin erosion was noted underneath the ear probe, presumably because of clipping pressure. It healed without any sequelae.

Case 3. An 8-month-old infant's ventilation was controlled following a repair of total anomalous pulmonary venous return. The left foot was fixed on a splint and a pair of fiberoptic finger probes of a pulse oximeter (Mochida MET 147®, Minolta) was attached for 5 continuous days. Upon removal of the probe, a localized tanned area coinciding with the photo-transmitter probe was noted. No thermal injury or skin burn was noted, and the hyperpigmentation had faded 3 months later.

DISCUSSION

Recent articles on the use of pulse oximetry mainly stress its usefulness and the non-invasive nature.[1–3] Although the complications described by us were of a mild nature, they could become serious if unnoticed for an extended period of time. Until real electric safety is established by the manufacturer, routine evaluation of the probe site is mandatory.

Pressure erosion or necrosis can and should be prevented. Until a better ear probe is developed, ear probes should be reclipped or relocated frequently during use. Although we have not experienced pressure necrosis, the tight application of flexible finger probes with elastic adhesive tape could cause this. The use of double-sided self-adhesive tape may solve this, but would prevent routine evaluation of the probe site because of possible skin abrasion upon removal, especially in premature infants. Since pulse oximetry does not require probes to be in tight contact with skin, unlike transcutaneous oxygen electrodes, the construction of probes may need to be modified to avoid these problems in pediatric use.[4]

In summary, non-invasive pulse oximetry is not necessarily harmless. We have observed one skin burn from

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Key words: Anesthesia: pediatrics. Complications: burn. Monitoring: pulse oximeter.

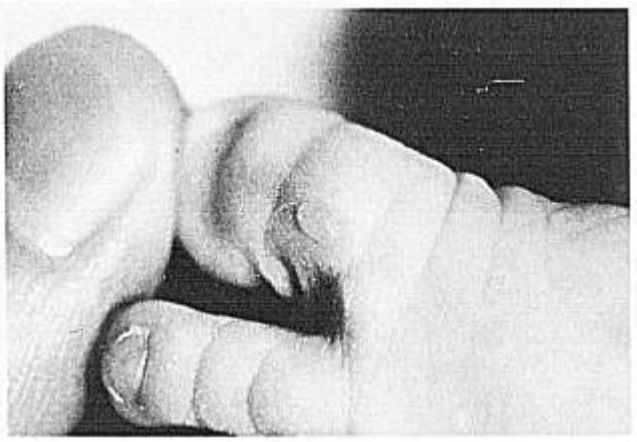

FIG. 1. A localized skin burn and blister formation developed underneath the photo-transmitter side of a pulse oximeter probe on the left great toe of a 3-month-old infant (case 1).

a 70° C LED, one ear pressure necrosis, and one ultraviolet skin tanning (with a fiberoptic model). This indicates that the probes used in pulse oximetry requires special attention and frequent probe site inspection.

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High-frequency Jet Ventilation During Thoracic Surgical Procedures

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Several modalities of ventilation have been proposed to prevent or minimize hypoxemia during thoracotomy,[1,2] including ventilation at supraphysiologic frequencies.[3–5] Since the differences among these modalities which utilize elevated rates are considerable,[6] we examined the impact of high-frequency jet ventilation (HFJV), administered at various rates, on gas exchange in patients undergoing thoracic surgery, both while the chest cavity was open and while it was closed.

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Key words: Anesthesia, thoracic: gas exchange; high-frequency jet ventilation. Lung. Surgery: thoracic. Ventilation: high-frequency; mechanical.

MATERIALS AND METHODS

The subjects were 120 patients scheduled for open thoracotomy involving resection of lung parenchyma or thoracic esophagus. The research protocol was approved by the Institutional Review Board, and written consent was obtained from each patient. All were premedicated with morphine, 5 mg im, and atropine, .4 mg im, approximately 1 h before surgery. Anesthesia was induced with sodium thiopental, 4 mg/kg iv, and succinylcholine, 1 mg/kg, and was maintained with an oxygen-nitrous oxide mixture (40:60–50:50), supplemented with intravenous fentanyl, droperidol, pancuronium bromide, and sodium thiopental as needed. Endotracheal intubation was performed with an 8–8.5-mm diameter National Catheter Hi-Lo® disposable endotracheal tube. This device had an extruded lumen that permitted measurement of airway pressure 5–6 centimeters above the carina. The airway pressure port was connected to a pressure transducer and a monitoring oscilloscope through an air-filled catheter. Inspired oxygen concentration ($F_{I_{O_2}}$) was measured with a paramagnetic oxygen analyzer placed between the ventilator Y-connector and the endotracheal tube. ECG was displayed on a monitor oscilloscope, and radial arterial and central venous pressures were directly measured *via*