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INK SMUDGED PROBE:AN UNUSUAL CAUSE OF FALSE LOW PULSE OXIMETRY READING

Anaesthesiology

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ABSTRACT

Pulse oximetry is a simple, accurate, universal, non invasive method of measuring arterial oxygen saturation. However, this technique is not devoid of limitations and therefore can show erroneous readings. We herewith discuss an interesting case of false low saturation reading in a patient due to ink smudging of the probe, in a case of emergency LSCS under general anaesthesia.

KEYWORDS

Pulse oximetry, saturation, plethysmography, probe, ink

INTRODUCTION

Pulse oximeter has revolutionized the modern anaesthesia practice as it monitors arterial oxygenation in a continuous, accurate and noninvasive manner.[1] Pulse oximetry has become an integral part of patient care so much so that arterial O_2 saturation has been called the 'fifth vital sign'.[2] Pulse oximetry combine the principles of oximetry and plethysmography to non invasively measure oxygen saturation in arterial blood.[3] Despite its multiple advantages, one of the major disadvantage is that there are circumstances in which pulse oximeters are unreliable and false alarms are fairly frequent.[1] We hereby present an interesting case of erroneously low oxygen saturation despite a normal plethysmography that was encountered during the post operative period of a patient who has undergone emergency lower segment cesarean section (LSCS) under general anaesthesia.

Case Report

A 25 year old primigravida weighing 55kg, at 35weeks gestation with severe preeclampsia and severe fetal distress was brought to the emergency OT for emergency LSCS. On preoperative assessment, patient gave history of cough with expectoration since 7 days and fasting was also found to be inadequate. Her BP in right arm in supine position was found to be 180/110 mm Hg. On auscultation of chest, conducted sounds were heard in bilateral lung fields and cardiac auscultation was unremarkable. Investigations revealed a low platelet count (65000/mm^3). Premedication in the form of injection ranitidine 50mg i.v. and injection metoclopramide 10 mg i.v. was given. After taking appropriate high risk consent, patient was shifted to OR with left uterine displacement. Monitoring for ECG, SpO_2 and NIBP was started. An infusion of IV nitroglycerin was started and dose titrated according to the blood pressure of the patient. After preoxygenation, rapid sequence induction was done with inj. thipentone sodium 250 mg and injection suxamethonium 75mg i.v. along with the application of cricoid pressure and trachea was intubated with cuffed ET (7mm ID). Lungs were ventilated with 100% O_2 till the delivery of baby. Immediately after baby was born, inj. Fentanyl 100µg i.v. was given and ventilation was done with 50% nitrous oxide and isoflurane in oxygen. Inj. vecuronium bromide 4 mg i.v. was given for intraoperative relaxation. Rest of the intraoperative period was uneventful. At the end of surgery trachea was extubated after reversing the residual neuromuscular blockade with inj. glycopyrrolate 0.4 mg i.v. and inj. neostigmine 2.5 mg i.v. Recovery was unremarkable and patient was shifted to the recovery room. Monitors for NIBP monitoring and pulse oximetry was attached. On auscultation occassional rhonchi were still present; hence nebulisation was started with salbutamol and ipratropium bromide. At that moment it was noted that pulse oximeter reading was showing an SpO_2 of 79% (ranging between75-85%) despite a normal waveform of plethysmograph (Figure 1). Patient had no fresh complaints. On examination, patient was conscious, comfortable, oriented and responding to verbal commands with a normal respiratory rate. No peripheral or central cyanosis was observed. The probe was readjusted in view of any malposition in sensor probe to be the reason behind the apparently spurious reading. The temperature of patient's hand was normal. No coloring material (henna) or nail paint was found to be on the corresponding finger. In order to confirm the SpO_2 finding, probe of the monitor of the adjacent bed was attached to another finger which displayed saturation of 99%. Hence, to find the fault with the probe, it was closely inspected and to our surprise blue ink was smudged over the light detecting photo diode of the probe, which was visible only on close, careful inspection (Figure 2). According to our institutional protocol, thumb impression of the mother and foot impression of the neonate with blue ink are recorded for identification purposes. The smudging of the probe could be due to its application on ink smeared finger of the previous patient which had been freahly smeared with blue ink. This smearing got unnoticed and failure to properly clean the probe resulted in the above clinical scenario. The probe was then properly cleaned to remove all the ink and reapplied on the patient's finger, an oxygen saturation of 99% was displayed on the monitor hence confirming our theory of blue ink causing spurious low SpO_2.

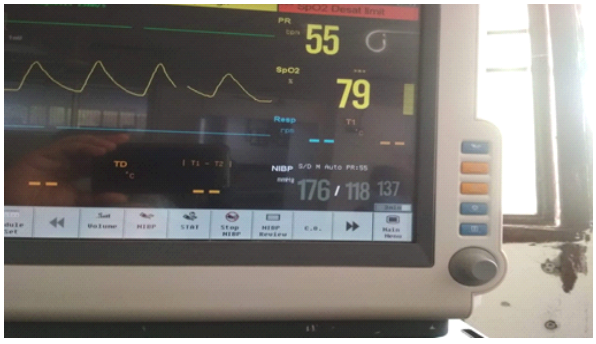

Figure1. Monitor showing an oxygen saturation of 79% despite a normal arterial waveform.

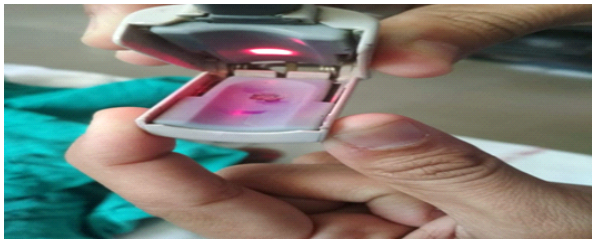

Figure2. Smudging of the light detecting photodiode of the probe with blue ink

DISCUSSION

Pulse oximetry is a simple, inexpensive, easily accessible and non invasive method to measure oxygen saturation in arterial blood. Pulse oximetry combines the principles of oximetry and plethysmography to measure arterial oxygen saturation. Oximetry is based on the property of all atoms and molecules to absorb light waves of specific wavelengths according to the principles of spectrophotometry and Lambert-Beer law. Oxygenated hemoglobin (Hb02) absorbs greater amount of infrared light where as deoxygenated hemoglobin (Hb) absorbs more red light.[4] Pulse oximeters use amplitude of the absorbances to calculate the red: infrared modulation ratio.[1] Then the ratio of oxygenated hemoglobin (HbO2) to total hemoglobin (HbO2+Hb) is used to define the fraction of hemoglobin that is saturated with oxygen. Plethysmography selectively measures and amplifies the pulsatile light transmission from arteries while dampens non pulsatile light transmission through veins, connective tissue, and skin.[5] There are many factors that can produce artefact in pulse oximetry which include, but are not limited to, excessive ambient light, motion, venous pulsations in a dependent limb, low perfusion (eg, low cardiac output, profound anemia, hypothermia), malpositioned sensor, nail paints or henna on nails and leakage of light from the light emitting diode to the photodiode, by passing the arterial bed.[6]

In the aforementioned case, the pulse oximetry gave a false low reading due to the blue ink smudged on the photodiode of the probe, which might have absorbed light at a wavelength very close to the strong red light as by deoxygenated hemoglobin, hence it resulted in an over estimation of the amount of deoxygenated hemoglobin in the blood. Thus, SpO_2 being the fraction of oxygenated hemoglobin to the total hemoglobin, revealed a falsely low reading of saturation. Moreover, plethysmography was normal and unperturbed throughout as there was no interference in the pulsatile blood flow to the fingers.

To conclude, such errors and interferences of pulse oximetry are preventable and can largely be eliminated. The probe should be handled carefully preventing against any fall, impact or soiling with blood, bodily fluids, medications etc. One should also be watchful that the wire doesn't get entangled, cut, caught or compressed between the arm rest or OR table. A proper pre-use check of the probe, including close inspection, to look for any smudging or staining on the inside on the light detecting photodiode of the probe, should be under taken prior to its use. All the personnels working in the ORs should be educated and sensitised regarding the up keeping, maintainence, importance and the economical aspect of not only the pulse oximeter but all the monitors. Maintaining daily log of the functioning and cleaning of all the routine equipments and monitors can go a long way in not only identifying and troubleshooting any discrepancy and errors in patient readings but also in ensuring the optimum patient care. Further, any low pulse oximetry reading must always be clinically correlated as pulse oximeters can give frequent false alarms and spurious readings. The causes of such false positive readings should always be kept in mind including smudging or soiling on the inside of the probe.

REFERENCES

1. Chan ED, Chan MM, Chan MM. Pulse oximetry: understanding its basic principles facilitates appreciation of its limitations. Respiratory Medicine 2013;107:789-99.
2. Neff TA. Routine oximetry. A fifth vital sign? Chest 1988;94:227.
3. Nitzan M, Romem A, Koppel R. Pulse oximetry: fundamentals and technology update. Med Devices (Auckl). 2014;7:231-239.
4. Marino PL. The ICU book. 4th ed. New Delhi: Wolters Kluwer; 2014. Chapter 21: Oximetry and capnometry;p.409-13.
5. Barker SJ, Tremper KK. Pulse oximetry: applications and limitations. Internat Anesthesiol Clin 1987;25:155-175.
6. Jubran A. Pulse oximetry. Crit Care. 2015;19(1):272.