CLINIQUIZ

Tissue oxygenation monitoring (StO_2)

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Note: *Select one best option*

1. Tissue oxygenation monitors utilise;
   a. infrared light
   b. near infrared light
   c. ultra violet light
   d. All of the above
   e. None of the above

2. Tissue oxygenation monitor works;
   a. Invasively
   b. Non-invasively
   c. Minimally invasively
   d. With remote sensing
   e. None of the above

3. Tissue oxygenation monitor has been proved to be superior than SpO_2 monitors in;
   a. Resuscitation of trauma patients
   b. Septic shock
   c. Hypothermic patients
   d. All of the above
   e. None of the above

4. Serious hypoperfusion (inadequate blood flow) is indicated by StO_2 levels of;
   a. 70%
   b. 75%
   c. 80%
   d. 85%
   e. 90%

5. The most sensitive site for probe application in StO2 monitor is;
   a. Index finger
   b. Thumb
   c. Thenar eminence
   d. Forearm
   e. Ear lobe

6. Peripheral vasoconstriction effects more the measurement of;
   a. SpO_2
   b. NIBP
   c. CVP
   d. StO_2
   e. All of the above

7. The following statement regarding StO2 is true;
   a. It is the quantification of the ratio of oxygenated hemoglobin to total hemoglobin in the microcirculation of a volume of illuminated tissue and is an absolute number
   b. Its principle of detecting oxygen saturation is similar to measuring oxygen saturation by pulse oximetry
   c. It is a valid measure of hemoglobin oxygen saturation
   d. a and c only
   e. All of the above

8. One important difference between SpO_2 and StO_2 is;
   a. Unlike SpO_2, StO_2 is a measure of oxygen saturation in the microcirculation where oxygen is exchanged with tissue and is therefore a local measure
   b. StO2 uses near infrared light, whereas SpO2 uses infrared light
   c. Measurements of SpO_2 and StO_2 both will not change with changes in the local conditions of supply and consumption in the tissue
   d. None of the above
   e. All of the above

9. The need for transfusion is best predicted by;
   a. blood pressure
   b. arterial lactate
   c. tachycardia
   d. StO_2
   e. hemoglobin concentration

10. StO_2 has been shown to possess a high "negative predictive value" (NPV) in several clinical trials in trauma patients of;
    a. a 91% chance of not developing multiple organ dysfunction
    b. a 96% chance of survival
    c. a 93% chance of receiving blood transfusion
    d. None of the above
    e. All of the above

ANSWERS:

1: b; StO_2 employs the use of near infrared light, which is transmitted through the skin, into the underlying tissues and takes measurements of the light, based on a patented algorithm, after it has achieved greater levels of penetration into the tissues.

2: b; It is a non-invasive technique.

3: d; Various researchers have now confirmed that StO2 is more sensitive index than SpO_2 in all of these conditions.

4: b; Thenar StO_2 values have been shown by Crookes BA and colleagues to be: normals, 87 +/- 6%; no shock, 83 +/- 10%; mild shock, 83 +/- 10%; moderate shock, 80 +/- 12%; and severe shock, 45 +/- 26%. 75% is usually accepted as the cut-off point for hypoperfusion) in trauma patients, and that StO2 levels above 75% indicates adequate perfusion.

5: d; A recent study by Bezemer R and cooleagues has shown that forearm StO_2 is a more sensitive parameter to hemodynamic changes than thenar StO_2 for the detection of central hypovolemia and hypovolemic shock in (trauma) patients and that the depth at which StO_2 is measured is of minor influence.

6: d; SpO_2 requires a pulsatile flow, while StO_2 readings do not. NIBP and CVP are also effected by many different pathologic conditions of the liver, heart and kidneys and are poor predictors of the tissue perfusion.

7: d; StO_2 is the quantification of the ratio of oxygenated hemoglobin to total hemoglobin in the microcirculation of a volume of illuminated tissue and is an absolute number. The measurement of StO_2 is taken with a noninvasive, fiber optic light that illuminates tissues below a sensor placed on the skin. StO_2correlates well with other accepted means of measuring oxygen saturation and the results of these studies demonstrate that StO_2 is a valid measure of hemoglobin oxygen saturation. StO_2 is a measure of oxygen saturation in the microcirculation where oxygen is exchanged with tissue and is therefore a local measure. Pulse oximetry, which also uses near infrared light, measures the systemic oxygen saturation of arterial blood.

8: a; StO_2 measurements differ from the SpO_2 measurements provided by pulse oximetry. StO_2 is a measure of oxygen saturation in the microcirculation where oxygen is exchanged with tissue and is therefore a local measure. Pulse oximetry, which also uses near infrared light, measures the systemic oxygen saturation of arterial blood. Measurements of StO_2 will therefore change with changes in the local conditions of supply and consumption in the tissue, and SpO_2 will not.

9: d; A recent clinical study involving 26 trauma patients at risk for hemorrhagic shock. Results from this study showed that of patients who required a transfusion within 24 hours of arrival in the ED, 88% had a minimum StO_2 below 70% in the first hour of arrival in the ED,* and of those who did not require a transfusion, only 22% had StO_2 values that dropped below 70% for the first hour. The need for transfusion was not predicted by conventional indicators of hypoperfusion and shock (blood pressure, arterial lactate, tachycardia, base deficit), nor by hemoglobin concentration.

10: e; StO_2 has been shown to possess a high NPV in several clinical trials in trauma patients. The first of these showed that, in patients believed to be at significant risk of shock, those who maintained an StO_2 at 75% or greater in the first hour of arrival in the ED had a 91% chance of not developing multiple organ dysfunction, and a 96% chance of survival. The clinical study by Smith et al.12 described above had a similar conclusion specifically with regard to the need for transfusion in a high risk trauma population. The probability of not requiring a transfusion within 24 hours of arrival at the ED was 93% if the StO_2 did not drop below their designated threshold of 70% for a period of one minute or more in the first hour.

REFERENCES

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