

Erroneously low continuous ScvO₂ reading due to red blood cells transfusion

P. Grassi, D. Leone, C. Vassallo

Department of Anesthesia and Intensive Care, Azienda Ospedaliero Universitaria, Ospedale di Cattinara, Trieste, Italy

HSR Proceedings in Intensive Care and Cardiovascular Anesthesia 2010; 2: 209-211

ABSTRACT

Hemoglobin oxygen saturation in superior vena cava (ScvO₂) is used as a parameter to guide hemodynamic management in shock patients and it can be continuously read through a central venous catheter equipped with a fiberoptic spectrophotometric probe (Edwards PreSep catheter) connected to a specific monitor (Edwards Vigileo).

We report of an episode of erroneous ScvO₂ reading by this technology in a patient with septic shock who was receiving an erythrocytes transfusion through the PreSep catheter main lumen. We think this artifact should be known by intensivists since it can lead to ScvO₂ misinterpretation and subsequent erroneous therapeutic decisions.

Keywords: *hemoglobin, oxygen saturation, desaturation, transfusion.*

INTRODUCTION

Hemoglobin oxygen saturation in superior vena cava (ScvO₂) is a commonly used parameter for hemodynamic monitoring in intensive care units (ICU) and operating rooms (1, 2). Even if ScvO₂ cannot be considered a completely reliable surrogate for SvO₂, it is nevertheless a useful tool for the evaluation of the balance between oxygen delivery and consumption in major surgery and critical illness (3).

A modified central venous catheter with a built-in infrared spectrophotometric probe for real-time hemoglobin oxygen saturation measurement is currently available from

the market (PreSep central venous oxymetry catheter, Edwards Lifesciences, Irvine, CA, USA). This device, when coupled with either an Edwards Vigileo or an Edwards Vigilance monitor (both Edwards Lifesciences, Irvine, CA, USA) gives continuous ScvO₂ reading after an initial calibration. We report here on a patient equipped with a PreSep catheter who apparently developed profound ScvO₂ desaturation during an erythrocytes transfusion through the catheter's main lumen.

CASE REPORT

A 57-years-old otherwise healthy male patient was admitted to the ICU with a diagnosis of septic shock. He underwent intestinal resection one year before for rectal cancer and was reoperated one month

Corresponding author:

Paolo Grassi, MD
 Department of Anesthesia and Intensive Care
 Azienda Ospedaliero Universitaria, Ospedale di Cattinara
 Strada di Fiume, 447 - 34149 Trieste, Italy
 e.mail: paolo.grassi@aots.sanita.fvg.it

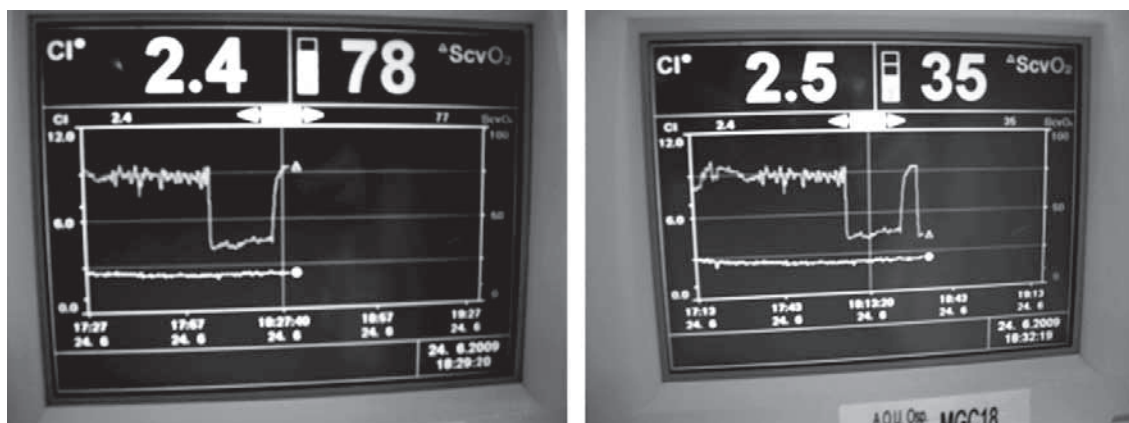


Figure 1

Left: Vigileo monitor trend lines showing rapid increase in $ScvO_2$ after clamping red cells transfusion line without any perturbation in cardiac index. Right: $ScvO_2$ drops to 35 % immediately after restarting transfusion, with a 2 points signal quality index.

before current admission because of intestinal occlusion due to visceral adherences. He subsequently developed fever, abdominal pain and hypotension and explorative laparotomy revealed gut perforation and peritonitis.

In the ICU he was treated with broad spectrum antibiotics, intravenous immunoglobulin and noradrenaline infusion because of persistent hypotension despite massive fluids administration.

For hemodynamic monitoring the patient was equipped with a Flow-Track sensor (Edwards Lifesciences, Irvine, CA, USA) on a radial arterial line and with a PreSep central venous catheter inserted in his left internal jugular vein, the tip of which was confirmed to be correctly positioned in superior vena cava by chest radiography. Both devices were connected to a Vigileo monitor revealing a cardiac index of 2,4 L/min/ m_2 and an $ScvO_2$ of 78 %.

One hour later, because of plasma volume expansion with cristalloid and colloid solutions, hemoglobin concentration dropped below 7 g/dl and the physician in charge ordered a 2 units red blood cells transfusion. After the transfusion was started through

the main lumen (14 gauge) of the PreSep catheter, and without any other evident modification in physiologic conditions or therapeutic intervention, an $ScvO_2$ value of 35 % was displayed on the Vigileo monitor. Since no other overt hemodynamic changes potentially responsible for this phenomenon was detectable, a causal association between the starting of the red cells transfusion and the $ScvO_2$ drop was hypothesized by the attending nurse.

The transfusion was then stopped by clamping the infusion line and immediately $ScvO_2$ raised and reached the stable value of 78 %.

Transfusion was then started again and $ScvO_2$ dropped immediately and reached 35 % after 20-30 seconds (Figure 1). Of note, displayed signal quality index (SQI) at this point was 2, indicating an acceptably good signal.

This procedure was repeated twice and was regularly followed by exactly the same phenomenon. We ascribed therefore the $ScvO_2$ drop to the passage close to the catheter's spectrophotometric probe of highly concentrated stored red cells rich in desaturated hemoglobin.

CONCLUSIONS

We believe physicians caring for critically ill and surgical patients should be aware of this possible artifact since ScvO₂ misinterpretation could potentially lead to inappropriate therapeutic decisions unfavourably affecting patients' outcome.

No conflict of interest acknowledged by the authors.

REFERENCES

1. Rivers EP, Ander DS, Powell D. Central venous oxygen saturation monitoring in the critically ill patient. *Curr Opin Crit Care* 2001; 7: 204-211.
2. Marx G, Reinhart K. Venous oximetry. *Curr Opin Crit Care* 2006; 12: 263-268.
3. Silva JM Jr, Toledo DO, Magalhães DD, et al. Influence of tissue perfusion on the outcome of surgical patients who need blood transfusion. *J Crit Care* 2009; 24: 426-434.