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## Absolute and Trending Accuracy of FORE-SIGHT and INVOS Cerebral Oximeters in Healthy Volunteers

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### Introduction

The purpose of this study was to compare measurements made by the FORE-SIGHT and INVOS cerebral oximeters against the “gold standard” of weighted co-oximetry jugular bulb and arterial oxygen saturation values during episodes of deliberate oxygen desaturation.

### Methods

Twelve healthy adult subjects were studied (8 male/4 female; 9 Caucasian/3 African American). Catheters were placed for blood sampling from the jugular venous bulb and radial artery and analyzed using a co-oximeter (Gem - 4000 IL) to obtain  $S_aO_2$  and  $S_{jv}O_2$ . Co-oximeter reference values, CX(F) and CX(I) were calculated based upon the formulas used in each monitor’s validation study:

$$CX(F)=[0.3 \times S_aO_2] + [0.7 \times S_{jv}O_2]$$

$$CX(I)=[0.25 \times S_aO_2] + [0.75 \times S_{jv}O_2]$$

Absolute and trending NIRS-derived cerebral tissue oxygen saturation values determined by the FORE-SIGHT ( $S_{ct}O_2$ ) and INVOS ( $rSO_2$ ) monitors were modeled as a function of CX(F) and CX(I) using linear regression. Bias and precision (1 standard deviation) were also determined.

Step changes in inspired oxygen were delivered at 5 min intervals switching from room air to 21% to 8%, back to 21% and finally to 50%.

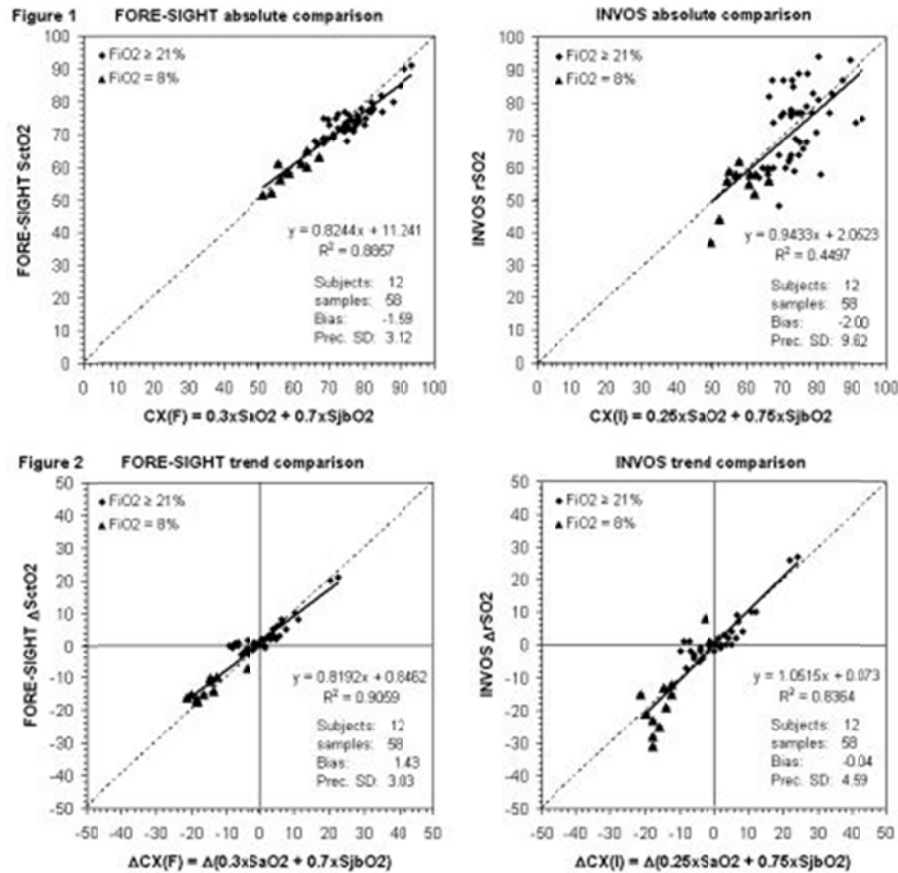
### Results

A total of 58 samples were analyzed. The range of baseline room air values for FORE-SIGHT  $S_{ct}O_2$  was 68-76% and for INVOS  $rSO_2$  was 48-89% whereas the corresponding reference values for FORE-SIGHT were 69.7-80.0% and for INVOS were 67.6-78.7%.

Regression lines for absolute cerebral tissue oxygen saturation values against co-oximeter reference values are shown in Figure 1. Regression lines for trending changes of cerebral tissue oxygen saturation values are shown in Figure 2.



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- When the oximeter readings were plotted against the co-oximeter reference values, the FORE-SIGHT data showed a much tighter, closer regression than the INVOS data (Figure 1, top graphs). This accuracy difference can be seen by comparing the standard deviations of 3.12% for FORE-SIGHT and 9.62% for INVOS.
- In two subjects, when room air was suddenly replaced with the hypoxic mixture (8% O<sub>2</sub>), the change in INVOS rSO<sub>2</sub> exceeded the change in its reference value by two standard deviations (9.16%), giving the appearance that cerebral oxygen saturation was falling more rapidly than it really was (Figure 2, bottom graphs). This exaggerated drop did not happen with FORE-SIGHT.

## Author's Discussion and Conclusion

The authors concluded that, "The results demonstrate that the FORE-SIGHT cerebral oximeter monitor has much greater precision with respect to measuring both absolute and trend changes in cerebral tissue oxygen saturation than the INVOS cerebral oximeter monitor."

## Citation

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