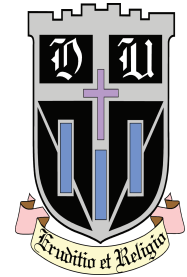




PILOT STUDY OF FORE-SIGHT™ CEREBRAL OXIMETER IN CARDIAC PATIENTS

AUTHORS: D. MacLeod, K. Ikeda, W. White, J. Keifer, E. Moretti;

AFFILIATION: Duke University Medical Center, Durham, NC.



Introduction:

Cerebral oximetry is a non-invasive, optically-based technique to monitor brain oxygenation continuously by determining cerebral tissue oxygen saturation (SctO₂). The CAS Medical FORE-SIGHT™ Absolute Cerebral Oximeter has been validated in a recent study of awake human volunteers during controlled oxygen desaturation (SpO₂ 70-100%) and showed a strong correlation between oximeter and calculated cerebral tissue oxygen saturation (Figure 1 & 2) [ref]. This observational pilot study was designed to determine the range of SctO₂ during various stages of cardiac surgery.

Methods:

With written consent, patients undergoing coronary artery bypass grafting (CABG) and/or valvular surgery (VS) with cardiopulmonary bypass (CPB) were enrolled. Two FORE-SIGHT Cerebral Oximeter Sensors (left/right) were placed on the patient's forehead prior to induction. SctO₂ values were recorded at 2-sec intervals; the 1-minute median value (derived from the 30 measurements per minute) was calculated for both sensor readings. The average of left & right cerebral tissue oxygen saturation measurements was used for analysis. At 14 predetermined events, the 5-minute median SctO₂ value was reported. The length of time SctO₂ values were below 55, 60 and 65% was calculated and tested for association with gender, race, diabetes and procedure type.

Results:

33 patients were studied (median age 68, years of education 13, gender 23M/10F, 29 W/4 AA, 8 diabetics, 27 CABG & 6 VS ± CABG [median cross-clamp time 73 v 123 mins, CPB time 112 v 178 mins]). Figure 3 shows typical traces of recordings throughout the surgery. The mean, interquartile range (IQR) and range of 5-minute median SctO₂ for the median Left/Right average SctO₂ values at the standardized event times are shown in Figure 4 (Figure 4 data is shown in Table 1). The median durations of time below 55/60/65% thresholds were 0/21/105 mins [CABG] and 88/131/191 mins [VS ± CABG]. Five of eight VS patients (63%) had >5 minutes below 55% SctO₂, compared to just three of twenty five (12%) CABG-only patients (p=0.01).

Discussion:

In this study, the median SctO₂ value of awake patients was 70%. Awake SctO₂ variability was small (SD 3.9%) independent of age, skin color and gender. The pre-CPB median SctO₂ (72%) dropped to 60% during CPB before returning to 68% at chest closure. VS patients showed longer periods below all 3 thresholds of SctO₂ values. This group had significantly longer cross-clamp and CPB times; this may have contributed to greater times below the thresholds. Further study is ongoing to evaluate the significance of this observation with regard to clinical outcome.

Reference:

Anesthesia Analgesia 2006; 102(25):S162

Table: Descriptive statistics for 5-minute median of L&R average cerebral tissue saturation by event

Event	#Cases	SctO ₂ L/R Average									
		Min	P10	P25	Median	P75	P90	Max	Range	Mean	Std
Room Air Breathing	33	61	65.3	68.2	69.7	72.2	74.7	82.9	21.9	70	4.1
O ₂ 100%	30	62.7	65.6	67.5	70.2	74.9	76.9	84	21.3	71	4.8
O ₂ 100% +10 min	30	67.1	70	71.3	74	77.6	79.2	88.6	21.5	74.6	4.4
Induction	33	67.4	68.4	70.2	72.3	76	78	89.5	22.1	73.2	4.7
Induction +15 min	33	57.5	61.8	65.3	70.3	74.6	76.4	83.5	26.1	69.6	6.2
Incision	33	57.4	61.3	62.7	66.1	73.6	75.2	79.1	21.7	68.2	6.1
Incision +15 min	32	59.3	64.8	67.5	70.8	73.6	80.4	84	24.6	71	5.6
Pre-CPB -5 min	33	52.5	58.6	67.4	71.6	75.9	80.5	86.9	34.4	71	7.8
CPB on +10 min	33	53.9	58.8	63.4	65.1	68.9	70.5	74.4	20.5	65.3	4.8
CPB on +30 min	33	53.7	57.9	61	62.6	65.1	67.6	74.8	21.1	63	4.2
Rewarm	29	50.5	53.8	56.8	60.4	64.4	68.8	73.2	22.7	60.8	5.3
Pump OFF	33	56.2	58.4	61.4	65.3	68.2	74.2	78.8	22.6	65.4	5.6
End CPB +20 min	33	55.9	59.6	63.6	66.5	69	75.9	80.2	24.3	66.7	5.7
Chest Closed	33	57.2	61.7	64.8	68	72	74.2	78	20.8	68	5

Table 1

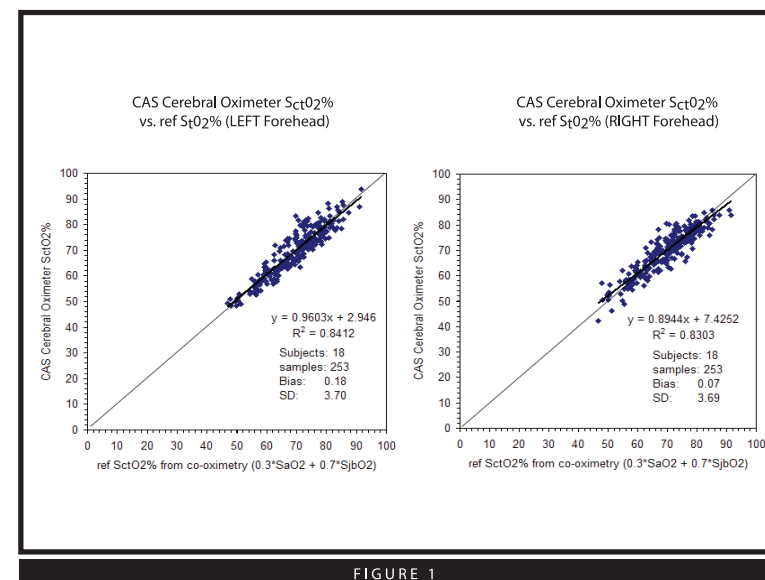


FIGURE 1

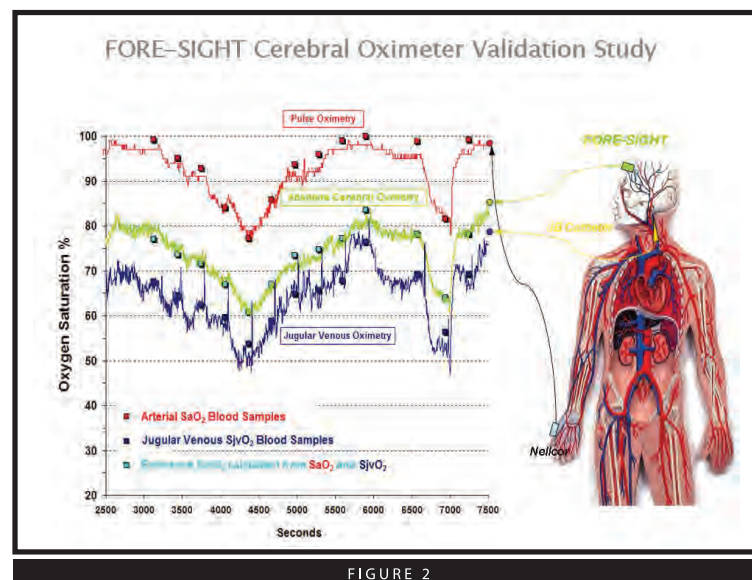


FIGURE 2

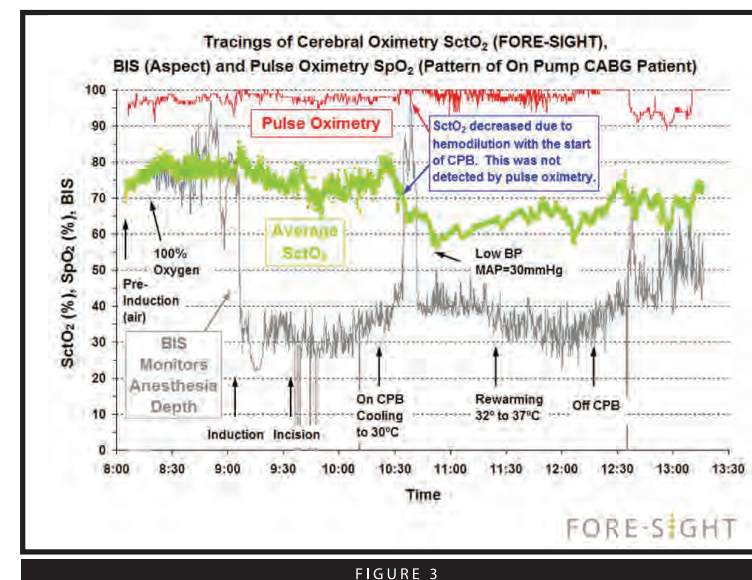


FIGURE 3

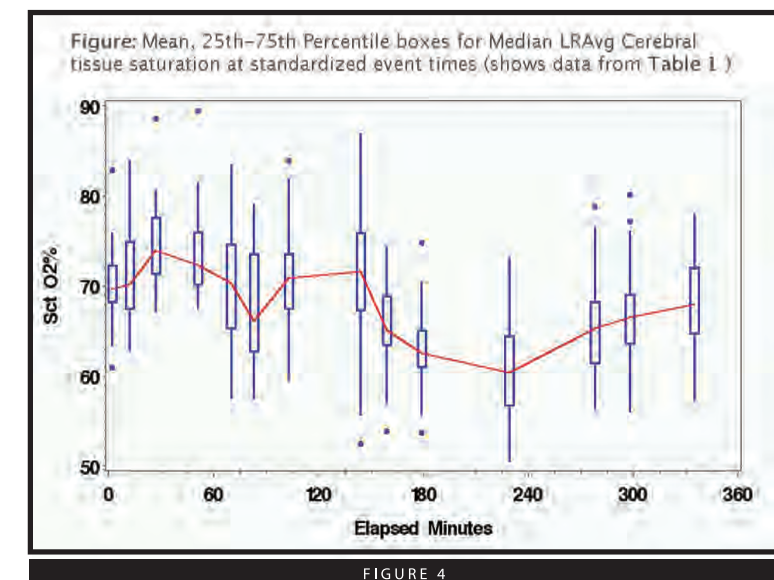


FIGURE 4