

Cerebral oxygenation measured by NIRS Fore-Sight technology reveals adequacy of cerebral perfusion during cardiopulmonary resuscitation

Ingrid Meex^{**}, Cathy De Deyne^{**}, Frank Jans^{**}, Jo Dens^{***}, Kevin Lathouwers^{*}, René Heylen^{*}

^{*}Department of Anesthesiology, ^{**}Department of Cardiology, Ziekenhuis Oost-Limburg, Genk (Belgium), ^{***}Faculty of Medicine, Hasselt University, Diepenbeek (Belgium)

Introduction

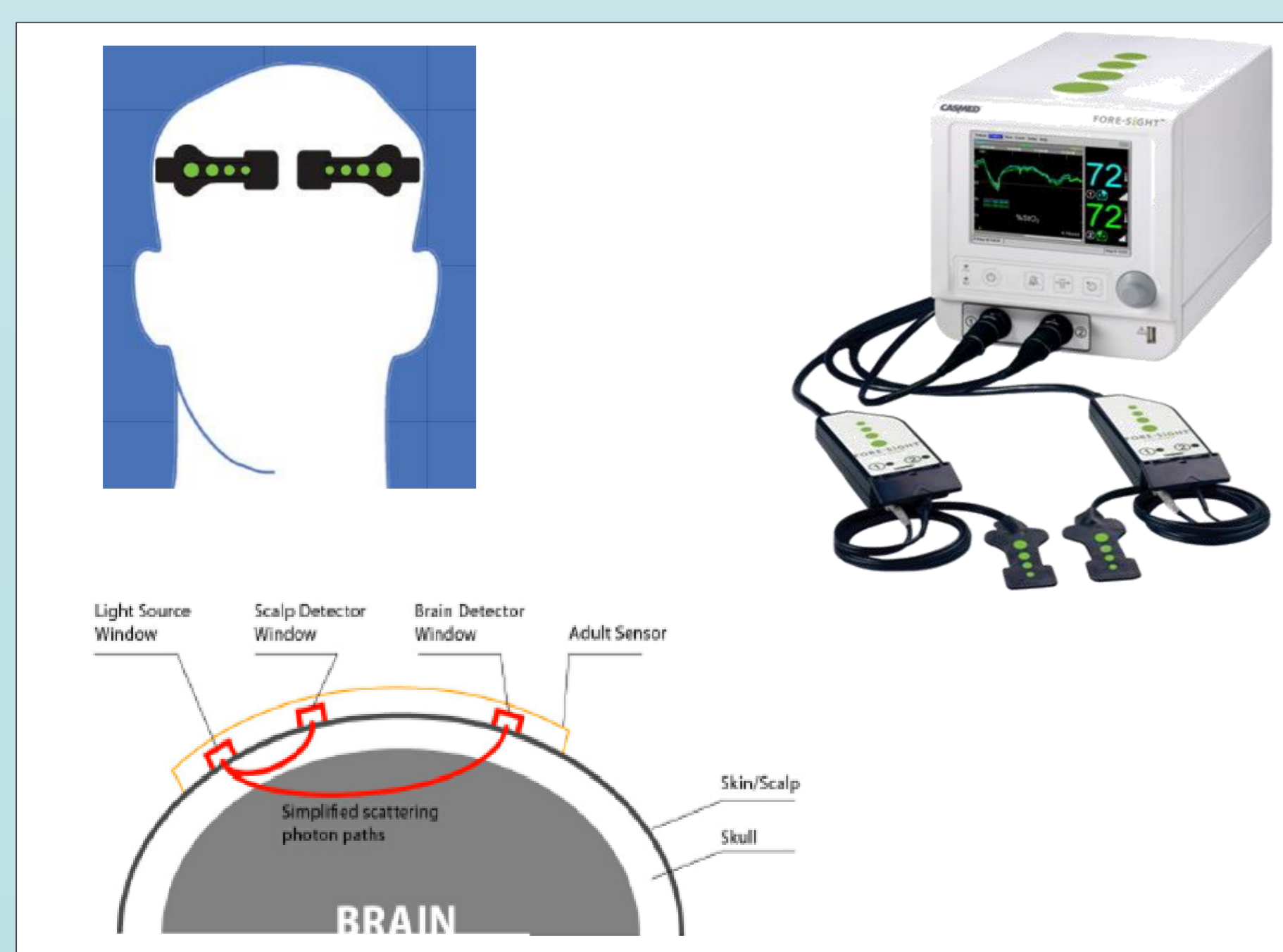
During cardiopulmonary resuscitation (CPR), current monitoring is limited to clinical observation of consciousness and breathing pattern. However, a favorable neurological outcome is influenced by adequacy of cerebral perfusion/oxygenation during CPR. Until now, it was not possible to monitor the effect of CPR on cerebral oxygenation.

Using near-infrared spectroscopy (NIRS), the FORE-SIGHT[®] technology (CAS Medical systems) provides a non-invasive continuous monitoring of the **absolute cerebral tissue oxygen saturation (SctO₂)**. Four wavelengths of laser light determine the levels of oxygenated and deoxygenated hemoglobin in the cerebral microvasculature. This study demonstrates the feasibility of the FORE-SIGHT[®] technology during CPR.

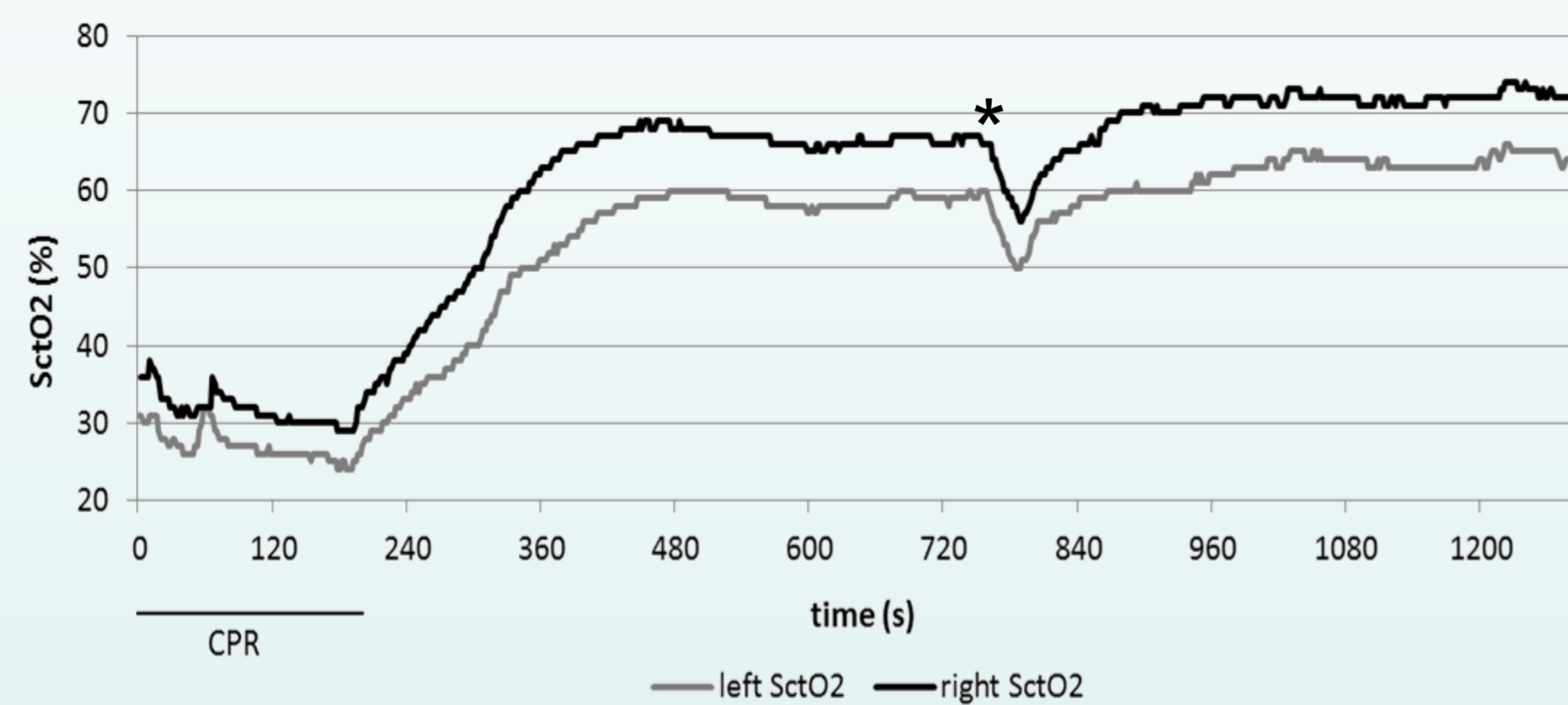
Patients and methods

After IRB approval, a Fore-Sight monitor was transported to the scene of cardiac arrest (CA). Non-invasive cerebral oximetry sensors were bilaterally applied and data was collected from arrival at the scene until end of intervention. Post hoc written informed consent was obtained from patients or their relatives.

Twelve patients were included in the study. CPR was already started before arrival of the medical intervention team. Reliable bilateral SctO₂ values were immediately obtained after application of the sensors, before return of spontaneous circulation (ROSC). In all patients, initial SctO₂ values were between 35% en 50%. SctO₂ values increased significantly with ROSC. In case of no ROSC, SctO₂ values remained stable below 50%.



Results

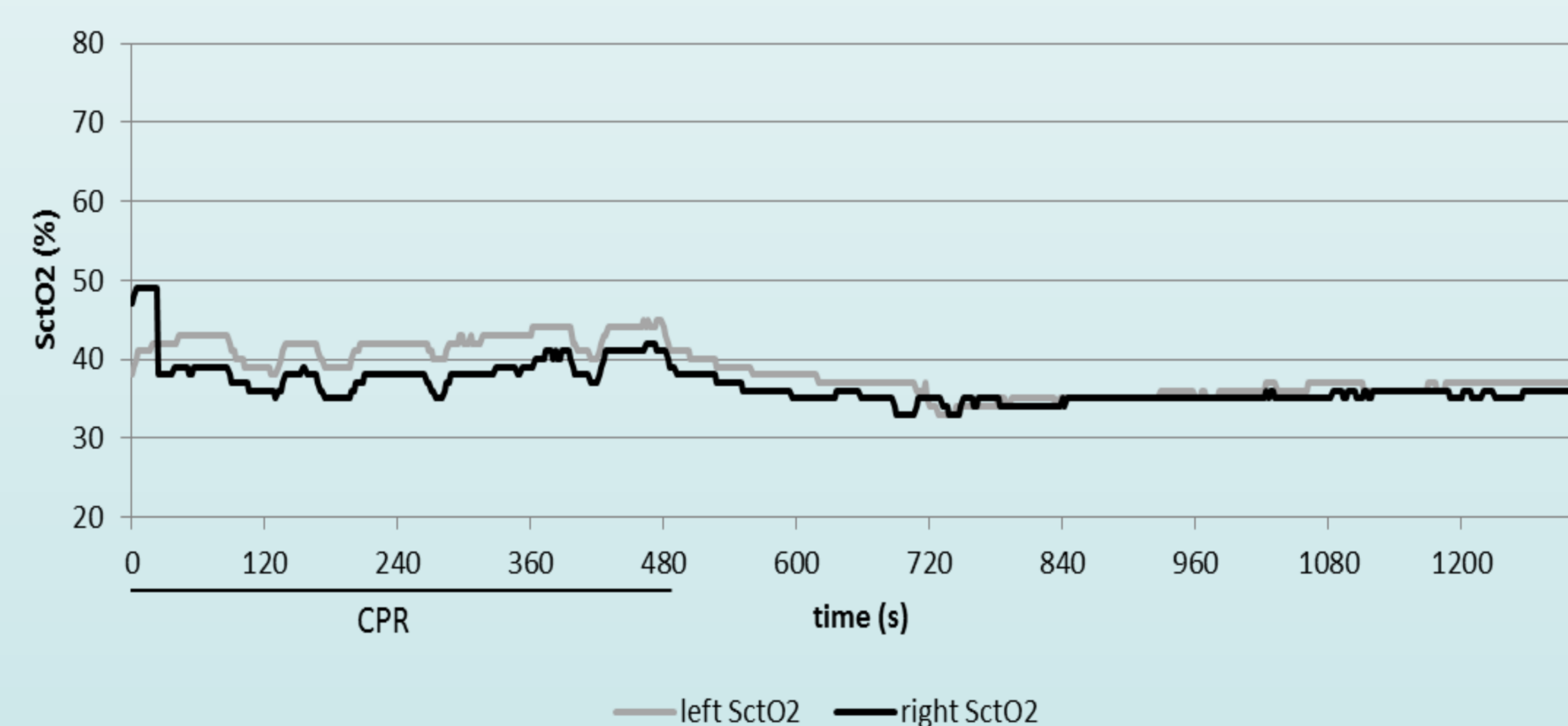


Male, 52 years – witnessed CA at home

Ventricular fibrillation

- initial values (before ROSC): 31% (left) and 38% (right)
- at ROSC: **increase** in SctO₂: 60% (left) and 68% (right)
- re-fibrillation (*): immediate **decrease** in SctO₂ values
- defibrillation: **increase** in SctO₂: 65% (left) and 71% (right)

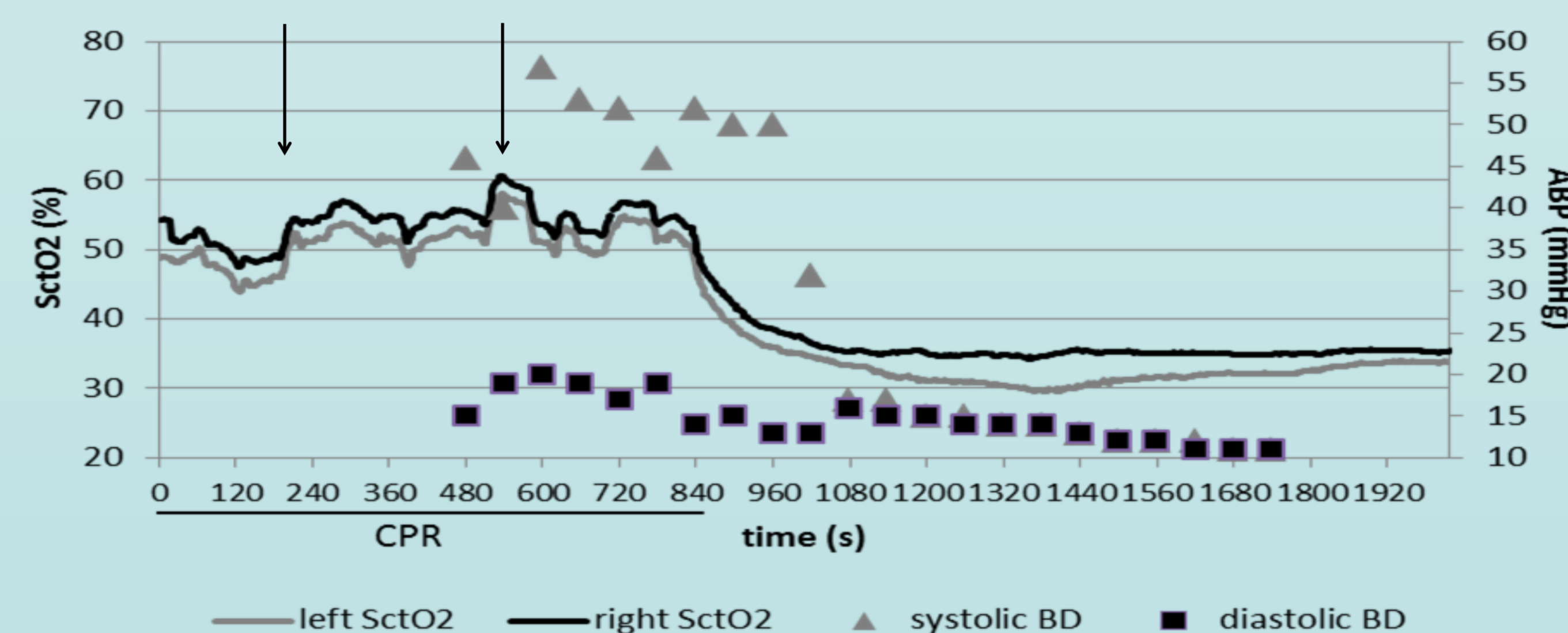
Patient was discharged without any neurological deficit



Male, 82 years – witnessed CA at home

Asystoly

- initial SctO₂ values: 39% (left) and 48% (right)
- during CPR: SctO₂ values never increased above 50%
- CPR efforts were stopped after 20 min.
- after cessation of CPR: SctO₂ values remained **stable** at 35%



Male, 51 years – in-hospital CA

measurement of invasive blood pressure

- initial SctO₂ (before ROSC): 49% (left) and 63% (right)
- improved chest compression (↓): **increase** in SctO₂ and BP
- CPR was stopped because of poor oncological prognosis
- after cessation of CPR: **decrease** SctO₂ below 35%

parallel decrease in systolic BP

Conclusion

The FORE-SIGHT[®]-technology provides real-time information on cerebral oxygenation and adequacy of cerebral perfusion during cardiac arrest and CPR.