ForeSight Elite tissue oximetry system: Early detection of cerebral desaturation triggered inotrope administration and led to successful patient outcome in complex, multi-procedure cardiac surgery

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A 77 year-old female presented with a history of shortness of breath on exertion, ankle swelling and tiredness. The patient had previously been diagnosed with persistent atrial fibrillation and managed with rate-controlling medication. Transesophageal echocardiography (TEE) revealed severe mitral regurgitation due to mitral annular dilatation and anterior leaflet prolapse into a dilated left atrium, moderate pulmonary hypertension and severe tricuspid regurgitation into a dilated right atrium. There was a small patent foramen ovale (PFO) with a left to right shunt. The left ventricular function was preserved, but the right ventricle was dilated with reduced systolic function. Cardiac MRI confirmed these structural findings and documented a right ventricular ejection fraction of 35% and a minimally dilated left ventricle with mild systolic impairment and an ejection fraction of 46%. Coronary angiography demonstrated normal coronary arteries. The patient was listed for elective Cox Maze IV procedure, mitral valve replacement/repair, tricuspid valve repair and PFO closure.

Cerebral oxygen saturation monitoring using the ForeSight Elite cerebral oximeter was commenced prior to the induction of anesthesia. Standard monitoring was supplemented by direct measurement of arterial and central venous pressures. The induction and maintenance of anesthesia were unremarkable. The pre-operative TEE findings were confirmed. Following the initiation of cardiopulmonary bypass (CPB), a Cox Maze IV procedure, mitral valve repair using an annuloplasty ring with a triangular resection of the anterior mitral leaflet, tricuspid valve annuloplasty and PFO closure were performed.

The patient separated from CPB with ease, supported by synchronised atrial/ventricular pacing, and maintained stable hemodynamics. TEE confirmed successful mitral and tricuspid valve repairs with no mitral or tricuspid regurgitation. The left ventricular function was good and the right ventricular structure and function were unchanged from the appearances before CPB. Arterial blood gas and acid base balance were unremarkable with a low lactate level.

After a period where cerebral oxygen saturations were stable above 60%, and despite the maintenance of normal hemodynamics, normal gas exchange, normal acid-base balance and a hemoglobin concentration above 10 g/dl by autologous transfusion, the ForeSight Elite cerebral oximeter demonstrated a progressive fall in the cerebral oxygen saturations to levels just above 50%. It was decided, therefore, to commence an inotrope to support the impaired right ventricle as evidenced by TEE. Dobutamine was commenced at a dose of 5 mcg/kg/min. The cerebral oxygen saturations responded quickly to the commencement of inotrope, stabilizing at levels above 65%. Hemodynamic measurements were unchanged.

Cerebral oximetry was continued in the immediate post-operative period on the intensive care unit the patient awoke with intact neurology after 8 hours following tracheal extubation. The cerebral oxygen saturations were maintained above 70% over this period. The dobutamine was continued for a further 24 hours and then weaned. The patient made an entirely uneventful recovery.

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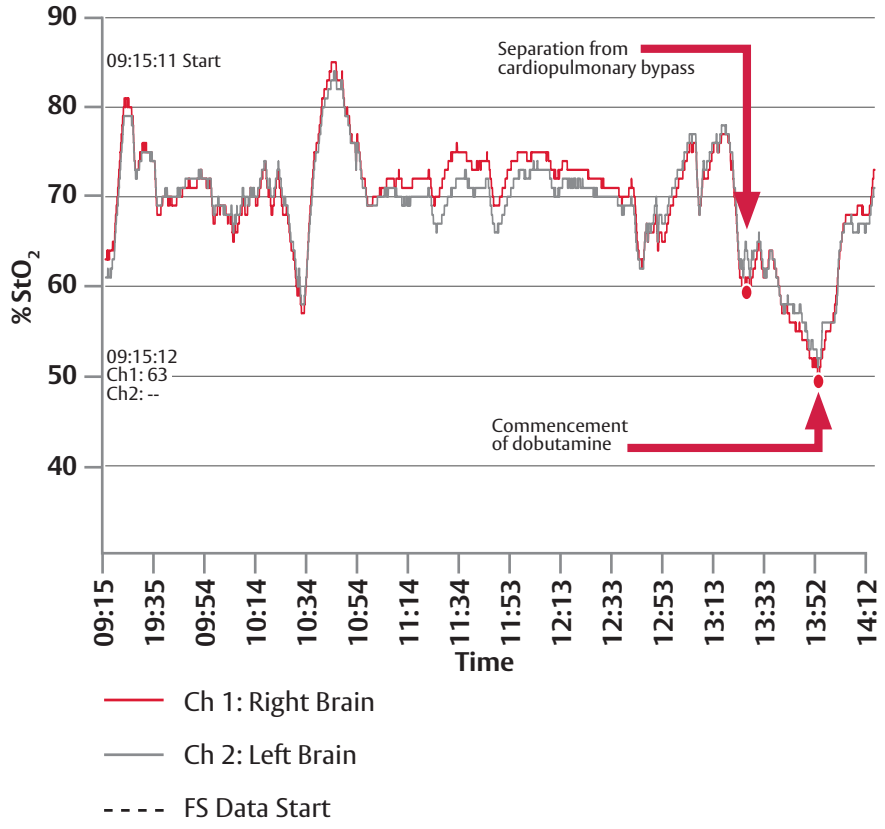
Conclusion

The progressive fall in cerebral oxygen saturations to levels of 50%, despite otherwise normal hemodynamics, normal gas exchange, normal acid-base balance, normal lactate and an adequate hemoglobin concentration, prompted the early use of inotrope to support the impaired right ventricle identified by pre-operative investigations and by peri-operative TEE. This early warning of deterioration by the ForeSight Elite cerebral oximeter allowed the attending team to modify their management to avoid potentially profound hemodynamics deterioration and contributed to a successful outcome for the patient.



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