

Cerebral oximetry demonstrates sequential cerebral desaturation events during complex aortic arch procedure

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An 83 year old woman with a 65 pack year history of smoking presented with a saccular aneurysm of the distal aortic arch discovered after further investigation of an incidental finding on a chest radiograph. She was also noted to have bilateral carotid disease with a < 40% stenosis of the right internal carotid artery and a < 50% stenosis of the left internal carotid artery. Following presentation to our vascular multidisciplinary team, the patient was listed for a debranching procedure of the aortic arch to be followed by endovascular stenting of the distal aortic arch. The carotid stenoses were left alone to be managed conservatively as the patient was not symptomatic.

Cerebral oxygen saturation monitoring using the ForeSight Elite tissue oximeter was commenced prior to the induction of anesthesia. Standard monitoring was supplemented by direct measurement of arterial pressure from the left and right radial arteries and by measurement of central venous pressure. The induction and maintenance of anesthesia were unremarkable.

The chest was opened by sternotomy. The ascending aorta and the aortic arch and its branches were identified, dissected free, and taped. The patient was heparinised, and the left subclavian artery was divided and its stump closed. The limb of a trifurcated graft was anastomosed in an end-to-end manner to the distal subclavian artery. The systolic arterial pressure was then reduced to 70 mmHg to allow side-clamping of the ascending aorta and attachment of the main limb of the graft to the ascending aorta before restoring flow to the left subclavian artery. The left common carotid artery was then divided (Point A), the stump closed, and the left common carotid artery was implanted in an end-to-side manner onto the left subclavian graft limb. Flow was restored to the left carotid system after a de-airing procedure (Point B). The innominate artery was then

transected (Point C) and an end-to-end anastomosis performed to a further limb of the trifurcated graft. The stump of the innominate artery was closed and flow restored to the innominate artery after a further de-airing procedure (Point D). The remaining limb of the trifurcated graft was not required and was tied off. The chest was closed following the administration of protamine, and the patient was transferred to the intensive care unit.

Cerebral oximetry was continued in the immediate post-operative period on the intensive care unit until the patient awoke with intact neurology following tracheal extubation.

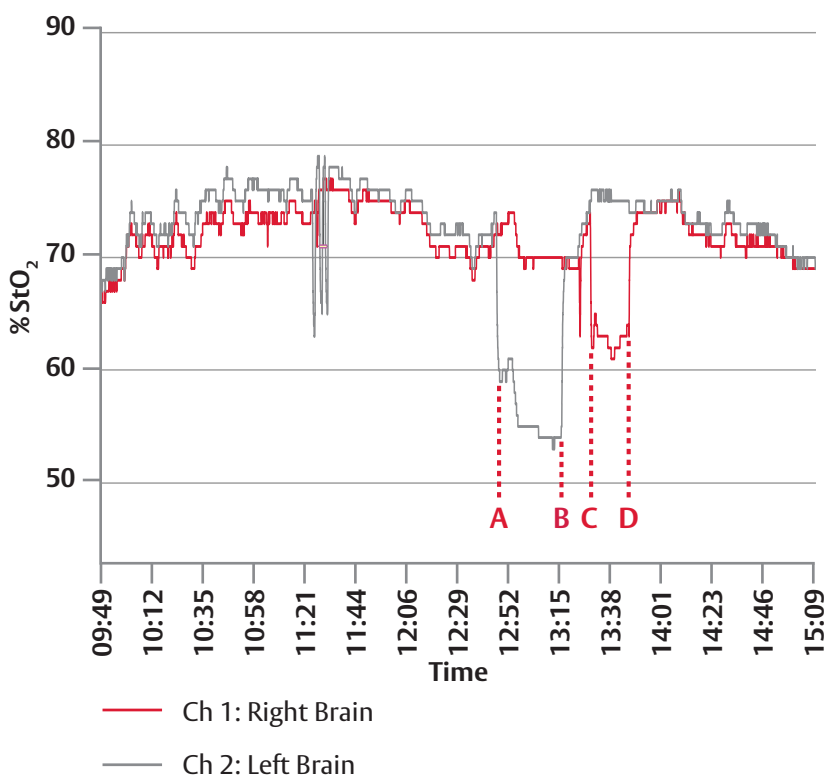
The patient made an uneventful recovery and has subsequently undergone successful endovascular stenting of the aortic arch at a sister hospital.

The accompanying graph describes the cerebral saturations during the operative period and demonstrates the disparity that developed between right and left frontal cerebral saturations during the consecutive periods of left and right carotid occlusion. The left cerebral saturations fell and stabilised to a level between 50 and 60% during left carotid occlusion. The right cerebral saturations fell and stabilised to a level above 60% during right carotid occlusion. Cerebral saturations stabilised above 70% following the restoration of carotid circulation.

The occurrence of cerebral desaturation events should always lead to a consideration of measures that might improve cerebral oxygenation. In the clinical scenario described, the only measure that could have been used to improve cerebral saturations during the periods of carotid occlusion would have been a shunting procedure. This was deemed unnecessary at the levels of desaturation that were demonstrated.

Conclusion

Measurement of cerebral oxygen saturations using the ForeSight Elite tissue oximeter can be used to assess the adequacy of cerebral perfusion and oxygenation. As demonstrated in this clinical case, cerebral perfusion may be compromised by the surgical procedure required to treat pathology of the aortic arch.



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