

Positive neurological outcome after acute neurosurgical hemorrhage and sustained hypotension

T. O'Barr MD, L. Gilbertson MD, A. Shbeeb MD, E. Ayrian MD, V. Zelman MD PhD

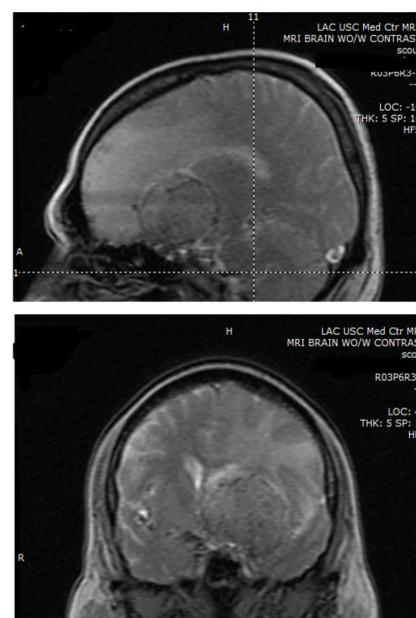
Keck Medical Center of USC, Department of Anesthesiology, Los Angeles, California 90033

Introduction:

About 75% of cardiac output is directed to vessel-rich tissues. During acute hemorrhage, cardiac output is redistributed to tissues of higher metabolic activity. We describe a case of preserved cardiac output during acute surgical hemorrhage and sustained hypotension.

Case Report:

- 65 year-old male to undergo resection of a meningioma without prior embolization therapy.
- Neurologic exam positive for mild aphasia/memory loss.
- Lasix/mannitol given upon induction.
- Propofol/remifentanyl for maintenance.
- Meningioma capsule incision resulted in rapid blood loss of 3300 mls. MAP's were 25-45 mm Hg for the next 3 hours with HR > 110 and $ETCO_2$ ranging 29-36 mm HG
- ABG's revealed metabolic acidosis from hypovolemia/hypoperfusion, corrected by massive transfusion/vasopressors. Total blood loss was 8000 mls.
- By POD 1, the patient was able to open his eyes. On POD 2 was following commands. No new cognitive/sensorimotor deficits observed at time of discharge.



Pre-operative MRI images of the meningioma

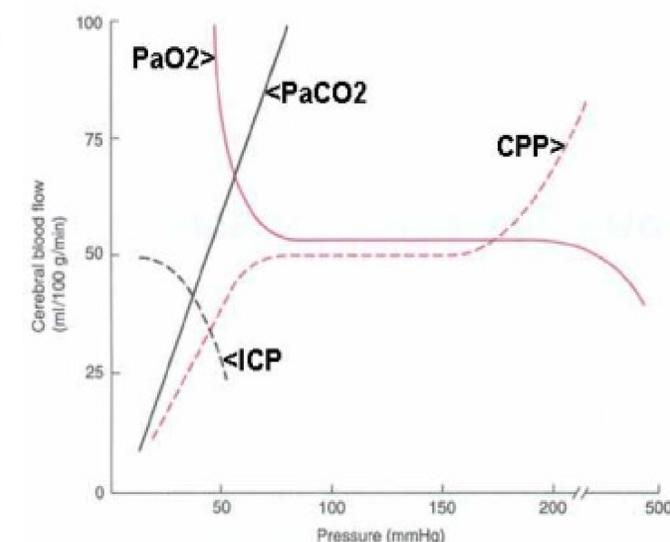
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- Graph from: <http://www.anesthesiawiki.net/metrohealthanesthesia/MHAnes/edu/neuro/icTumors1.htm>

Discussion:

Severe hypotension and global cerebral ischemia can lead to poor patient outcomes. Our patient had a positive neurologic outcome despite sustained hypotension, which can be attributed to several mechanisms:

1. The redistribution of the cardiac output to major organ systems as evidenced by a preserved $EtCO_2$. Intra-op hypotension can worsen outcome but studies have proved that a lower SBP during hemorrhage did not affect mortality. Functional or histologic brain damage was not seen in rats following hemorrhagic shock. Despite hypotension, perfusion to vital organs is adequate while decreased in other organ systems such as the splanchnic system.
2. Propofol offers cerebral protective effects through its action on GABA receptors, free radical scavenging, and limiting lipid peroxidation. It also attenuates of the catecholamine surge seen during ischemia.
3. ICP reductions with the use of mannitol and lasix permit adequate CPP during sustained hypotension.



Conclusion:

Our patient's survival and positive neurologic outcome after major blood loss and hypotension can be attributed to a few key cerebral protective mechanisms.

- Preservation of cerebral blood flow by redistribution during times of hypotension.
- Agents that promote cerebral protection by improving CPP and attenuating the cellular effects of ischemia.