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TITLE: THE POSTOPERATIVE HYPERDYNAMIC CARDIOVASCULAR RESPONSE FOLLOWING INTRACRANIAL EXCISION OF ARTERIAL VENOUS MALFORMATION (AVM)

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This study in the neurovascular surgical patients evaluates the peripheral hemodynamic effects in patients with arterial venous malformation without prior history of any cardiovascular disease.

After IRB approval and informed consent, a pulmonary artery catheter was placed either prior to induction or 15 min post intubation in 6 patients with a documented intracranial AVM. Anesthesia was induced with sufentanyl or fentanyl and 2-3 mg/kg sodium thiopental intravenously (IV). Muscle relaxation was initially obtained and subsequently maintained with vecuronium. Maintenance of anesthesia was with isoflurane and nitrous oxide with a FIO₂ of 0.50 and supplemental doses of fentanyl or sufentanyl as needed. The combination of isoflurane and sodium nitroprusside was used for induced hypotension to a mean arterial pressure (MAP) of 50 mmHg or 50 mmHg < the preoperative MAP. The following hemodynamic parameters were obtained following intubation, during induced hypotension, 15 min post excision of the AVM, one hour after arrival in the post anesthesia care unit, and 12, 24 and 36 hours in the neurointensive care unit: cardiac index (CI), left ventricular stroke work index (LVSWI), stroke index (SI), heart rate (HR), MAP, pulmonary artery occlusion pressure (PAOP), oxygen consumption, oxygen delivery, arterial-venous difference (A - v DO₂). Postoperatively, the BP was controlled within 10% of the preoperative MAP.

The results revealed significant differences of p < 0.01 of heart rate, stroke index, oxygen delivery and oxygen consumption at 12 and 24 hrs in the neurointensive care unit when compared to baseline measurements. There were significant differences of < 0.001 of cardiac index at 12 and 24 hrs when compared to baseline measurements. In regard to left ventricular stroke index at 24 hrs there was significant differences of p < 0.05 when compared to baseline measurements. There were no significant differences in mean arterial pressure or A - v DO₂ from baseline measurements.

Hyperdynamic cardiovascular hemodynamics is usually associated in patients with beri beri, thyrotoxicosis, acute anemia, sepsis and liver failure. However, this study revealed that there was a marked hyperdynamic state with increases in cardiac index, stroke index, left ventricular stroke index and heart rate in the postoperative period at 12 and 24 hours compared to initial baseline measurements prior to surgical incision. It appears that the hyperdynamic response is centrally mediated. This has been seen in patients that have a cerebral aneurysm which have hemorrhaged. However, in patients who have cerebral arteriovenous malformation without prior cardiovascular disease or the need of antihypertensive medications developed in the postoperative state (post excision of AVM) a marked hyperdynamic response that required moderate amount of antihypertensive agents to control the mean arterial pressure to the normotensive levels. This has not previously been reported and appears to be related to the altered cerebral vascular hemodynamics post excision of AVM.