

Anesthetic Management During Posterior Spinal Fusion in a Patient with Moyamoya Disease

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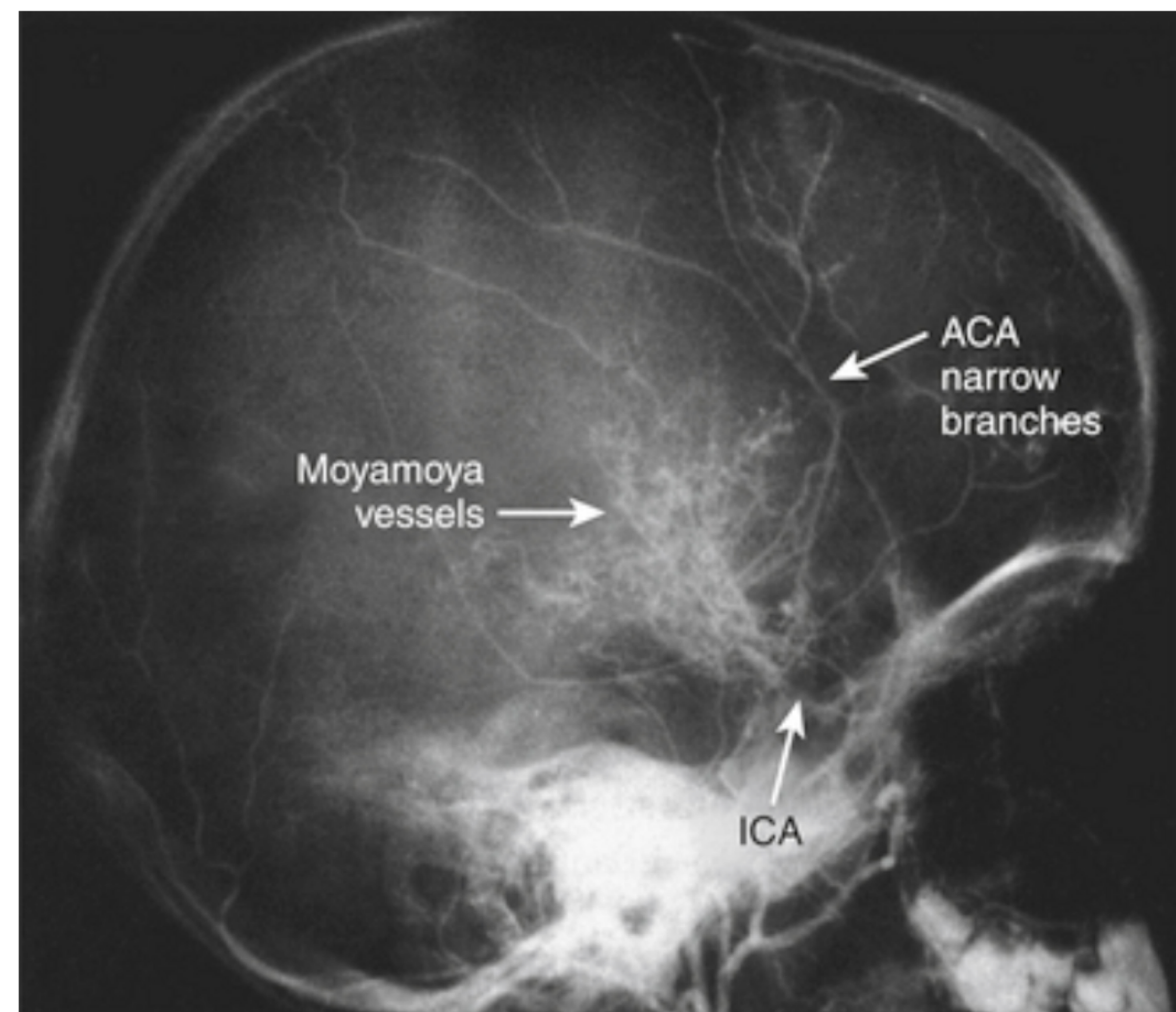
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Background

Moyamoya disease (MMD) is a central nervous system arteriopathy leading to ischemic and thrombotic strokes. Collateral circulation creates the angiographic appearance of a “puff of smoke” giving the disease its name. Multi-organ involvement and co-morbidities may require surgical intervention. We present a patient with MMD who required anesthesia for posterior spinal fusion (PSF) for neuromuscular scoliosis. Intraoperative physiologic parameter management, cerebral oxygenation monitoring via near infrared spectroscopy (NIRS), and options for anesthetic care are reviewed.



Lateral view, right carotid angiography showing moyamoya vessels. Supraclinoidal segment of ICA. MCA cannot be seen clearly. The ACA branches are extremely narrowed.

Image from: <https://clinicalgate.com/surgical-treatment-of-moyamoya-disease-in-adults/>

Patient History

- 18-year-old female with history of MMD, prior left MCA stroke, cerebral palsy, spastic quadriplegia, seizures, asthma, G-tube dependence, sickle cell disease s/p bone marrow transplant
- Anesthetic history of difficult IV access, slow emergence, perioperative respiratory insufficiency
- Unable to obtain preoperative lab values due to difficult venipuncture
- Scheduled for posterior spinal fusion with instrumentation and pelvic fixation for neuromuscular scoliosis

Lines and Monitors

- Peripheral IV catheters: 20 gauge (hand) and 14 gauge (basilic vein using ultrasound guided)
- Radial artery arterial line
- Internal jugular central venous line (5 French, 12 cm, double lumen)
- Standard ASA monitors
- Motor evoked potentials and somatosensory evoked potentials
- Near infrared spectroscopy (NIRS): baseline 83 on the left, 77 on the right
- Bispectral index monitor

Anesthetic Goals

- Mean arterial pressure 75-85 mmHg
- NIRS values within 20% of baseline (>60)
- BIS goal 50-60
- Normocapnia
- Normothermia
- Normovolemia

References

1. Scott RM, Smith ER. Moyamoya disease and moyamoya syndrome. N Engl J Med 2009;360:1226-37.
2. Tobias JD. Cerebral oxygenation monitoring: near infrared spectroscopy. Expert Rev Med Devices 2006;3:235-43.
3. Guey S et al. Moyamoya disease and syndromes: from genetics to clinical management. App Clin Gen 2015;8:49-68.

Anesthetic Course

- Inhalation induction with sevoflurane
- Midazolam, propofol, and rocuronium given for endotracheal intubation
- Maintenance with remifentanyl infusion at 0.1-0.3 µg/kg/min, desflurane at 0.5 MAC, and phenylephrine infusion
- Transported to surgical ICU postoperatively in stable condition with hydromorphone NCA and IV acetaminophen
- Extubated a few hours after arrival to ICU
- Discharged from hospital on POD 8

Fluids and Blood Products

- EBL 2,200 mL
- 4 units PRBCs
- 3,525 mL cell saver
- 1 unit FFP
- 1 unit platelets
- 6,000 mL crystalloid
- 1,750 mL 5% albumin

Discussion

MMD is found across all ethnicities with increased incidence in the East. Patients present during two age ranges; 5-10 years old with ischemic events and 40-50 years old with hemorrhagic events. Treatment includes medical management with aspirin or surgical management via pial synangiosis. The primary goal in perioperative management is balancing cerebral oxygen delivery and demand with normotension, normovolemia, normocapnia, and normothermia. Our case illustrates the role of NIRS monitoring which provided a continuous measure of the impact of intraoperative physiological parameters on global cerebral oxygenation.