Case Report
Volume 5:2, 2021

Journal of
Clinical Anesthesiology

Open Access

Successful Anesthesia Management of Left Fronto-Temporal Craniotomy for Intracranial Vascular Malformation (IVM)

Yilkal Tadesse Desta[1]*, Kassaw Moges Abera[2]

[1]*Department of Anaesthesia and Critical Care, Bahirdar University, Ethiopia*

[2]*Department of Anaesthesia and Critical Care, Bahirdar University, Ethiopia*

Abstract

Introduction: Stroke is an ischemic/embolic or hemorrhagic cerebrovascular event that can occur at any time. Meanwhile, intravenous or endovascular intra-arterial thrombolysis is the current standard therapy for intracranial intravascular clots, embolic occlusion of a major intracranial vessel occasionally requires microsurgical embolectomy. In particular, when the embolus is a large atherosclerotic plaque or foreign body (such as a balloon or microcoil from endovascular treatment), surgery may be the treatment of choice.

Case history: This is a 70 years old female patient who came with a chief complaint of 'failure to communicate of 12 hrs duration' and diagnosed to be recurrent 2˚stroke+old R_t side stroke+type II DM+HTN.

Discussion: Several studies have demonstrated that patients who received general anesthesia for treatment are less likely to have a good outcome than those managed with local anesthesia. This may be due to preintervention risk not included in the stroke severity measures.

Summary: Neuroanaesthesia is a dynamic and rapidly advancing sub-specialty where anesthetic technique can have a real impact on both operative conditions and patient outcomes. Advanced airway skills, multimodal monitoring, and the management of challenging and complex cases are required on a regular basis.

Conclusion: Preintervention risk should always be minimized and blunted to avoid stroke severity and also to avoid irreversible ischemic damages. Additionally, preoperative routine medication with statins and b-blockers should be continued during the perioperative period and also propanol infusion should be considered to replace N_2O, Mannitol 0.5 g/kg-1 g/kg, Furosemide 0.3 mg/kg for better lumbar CSF drainage and brain relaxation.

Control of blood pressure is critical for this patient to have successful outcomes and progress and also to avoid the risk of postop hemorrhage. This is mainly because an acute ↑↑ BP →↑↑ transmural pressure across the aneurysmal wall → ruptures of the aneurysm and course body temperature should be maintained normothermic to have good recovery and progress.

Keywords: Neurosurgery • Anesthesia • Intracranial Vascular Malformation • Craniotomy

Introduction

Stroke is an ischaemic/embolic or hemorrhagic cerebrovascular event that can occur at any time. Meanwhile, intravenous or endovascular intra-arterial thrombolysis is the current standard therapy for intracranial intravascular clots, embolic occlusion of a major intracranial vessel occasionally requires microsurgical embolectomy [1,2]. In particular, when the embolus is a large atherosclerotic plaque or foreign body (such as a balloon or microcoil from endovascular treatment), surgery may be the treatment of choice [3].

Case History

This is a 70 years old female patient who came with a chief complaint of 'failure to communicate of 12 hrs duration' and diagnosed to be recurrent 2° stroke+old R_t side stroke+type II DM+HTN. After admission to the neurosurgery department of Myngsung Christian Medical (MCM) Center in Addis, the patient successfully underwent left tempro-frontal craniotomy with drainage and decompression of hematoma. Intraoperatively her vital sign remained stable until emergency time but she had poor respiratory effort and oxygen-dependent from the machine. Fortunately, the patient withstood the procedure well and transferred to the main ICU stable. Finally, the patient withstood the ICU stay well and recovered in ICU with a close under observation.

Hx: She had a previous Hx of stroke 10 years back, which resulted in right-sided weakness and she had some cardiac surgery for narrowed vessels. She had been taken globenemide and ASA but not on any of the anti HTN medications. At a time she was unconscious but no abnormal body movements

P/E: G/A; sub-critical condition

V/S; BP-140/76, PR-145, RR-20, T^0-ATT HEENT; some palmar pallor, NIS, LGS; no LAP, Resp fine crepitation both lung, CVS; S1 and S2 well heard, NS;

GCS: 5/15, (E-2, M-3, V-1,) Power: UL-4/5, UR-0/5, LL-4/5, LR-0/5.

Pupil: 3 mm-4 mm and sluggish reaction

Additional investigations

Electrolyte: (Na-137, K-3.6, Cl-100) Thyroid profile: (T3-0.87, T4-95.32, TSH-0.67) and some other imaging workup results found included CT (petechial hemorrhages in left frontal-temporal) which shows possible recurrent stroke same side (L_t) and from CXR-dilated cardiac vessels.

Basic investigations

CBC, PT, PTT, INR, and OFT all were in the normal range

***Address for Correspondence:** Yilkal Tadesse Desta, Department of Anaesthesia and critical care, Bahirdar University, Ethiopia, E-mail: destayilkal999@gmail.com*

Received 12 March 2021; **Accepted** 30 March 2021; **Published** 07 April 2021

Figure 1. Patient ready for surgery after appropriate preparation and positioning.

Electrolyte: (Na-137, K-3.6, Cl-100) Thyroid profile: (T3-0.87, T4-95.32, TSH-0.67) and some other imaging workup results was also done including CT (petechial hemorrhages in left frontal-temporal) and the result shows possible recurrent stroke same side (L_t) and from CXR-dilated cardiac vessels

Methodology

After the patient is taken to the operation room, and with appropriate smooth induction the patient was intubated (but no sedative infusion being given). Under general anesthesia top up with gas sedation, patient positioned for surgery (Supine position, head elevated above heart over Sugita frame, turned 30°-45° to side, vertex dropped for an approach to anterior circulation aneurysms and frontal vascular malformations). Bicoronal flap was marked and infiltrated after cleaning and draping, craniotomy was done with a drill, dura opened based over superior sagittal sinus, and AVM localized with intraop USG.

Two big arterial feeders were coagulated and the nisus was separated from all feeders, one large venous drainage coagulated at last complete hemostasis achieved after removal of Nidus of AVM and gliotic tissue suction drain and wound closed in layers with G plast duroplasty (replacing back bone flap) and dressing done.

Her vital sign remains stable until emergency time but she had poor respiratory effort and oxygen-dependent from the machine, patient transferred to the main ICU and put on mechanical support (IPPV mode) with regular 'FASTHUG' critical review was done accordingly.

Finally, she recovered under observation in ICU and even complained 'why those of you let me out', which wonder was what really wonder of the team and interested most.

Postoperatively the patient had had one seizure with a prolonged post ictal period and Phenytoin (1 gm loading dose) was given and medications ordered postoperatively include (Ceftriaxone 1 gm IV bd, Metronidazole 500 mg IV td, Digoxin 0.5 mg IV stat, Vancomycin 1 gm. IV bd, Coated aspirin 8 mg od, Simrostatin 20 mg od, continue with sliding scale, Enoxaparin 40 mg s/c od, plus to regular analgesia.

Discussion

Several studies have demonstrated that patients who received general anesthesia for treatment are less likely to have a good outcome than those managed with local anesthesia [3]. This may be due to preintervention risk not included in the stroke severity measures. Hypotension, more frequent in general anesthesia patients, may also contribute a lot to this specific problem. Studies have also demonstrated that the best results from embolectomy occur when the procedure is performed within 6 h following the onset of a neurologic deficit [2]. The discussion below implies important points regarding the optimal anesthetic approaches and considerations for this specific procedure [4].

Anesthetic technique done was General Endotracheal Anesthesia with standard induction (GETA), and for induction after Thiopental 2 mg/kg-5 mg/kg or propanol 2 mg/kg-3 mg/kg provides amnesia and ↓ CBV by inducing cerebral vasoconstriction. Fentanyl 7 mcg/kg-10mcg/kg blunts the response to laryngoscopy and provides analgesia for the first hours. High-dose opiates used as a primary anesthetic technique do not alter CBF or $CMRO_2$ enough to provide any special benefits. Vecuronium (0.15 mg/kg), rocuronium (0.6 mg/kg-1 mg/kg), or pancuronium (0.1 mg/kg), provide muscle relaxation for intubation and patient positioning. Occasionally the patient may be in a stereotactic frame and ET intubation must be accomplished before anesthesia is induced, because the frame partially occludes the mouth, making conventional laryngoscopy impossible. Awake oral fiberoptic intubation of the trachea is the easiest method for accomplishing this [5].

Positing was patient is supine, head turned laterally in three-point fixation, a roll under shoulder on the side of the operation. Anesthetic hoses and all monitoring/vascular catheter lines are directed toward the patient's feet or side. Make sure that all will reach the foot of the operating table. SCDs are used to minimize DVT. Remifentanil (2 mcg/kg-4 mcg/kg iv bolus) should be used to minimize ↑ BP during skull pinning (4)

Standard monitoring should be considered including; Core temp: deep esophageal best Arterial line CVP line, triple lumen UO Blood glucose (100 mg-180 mg) direct monitoring is essential for rapid control of BP. Transducer should always be placed at the level of the head rather than the heart since CPP is arterial pressure at the brain level minus CVP or ICP, whichever is higher. Monitoring CVP *via* a near right atrial catheter is desirable in virtually all patients to assess the adequacy of fluid therapy, for infusion of vasoactive drugs and aspiration of VAE. Localization of the catheter can be determined by CXR, ECG tracing, noting P-wave changes, or pressure-wave contour and value as the catheter is withdrawn from the right atrium [5].

Intraoperative the patient was maintained with Isoflurane ≤ 1% or sevoflurane ≤ 2% (limit to 1/2 MAC maximum if EP monitoring is used) with 1:1 O_2/N_2O. With EP monitoring, a remifentanil infusion (0.05 mcg/kg/min-0.15 mcg/kg/min) may be necessary to supplement the anesthetic. Propanol (75 mcg/kg/min-150 mcg/kg/min) by continuous infusion may be administered to provide ↓ CBV and ↓ $CMRO_2$, and allow for the reduction in inhalation agent concentration or elimination of N_2O. Mild hypothermia (33°C) provides additional cerebral protection. Additional neuromuscular blocking drugs are usually not necessary but can be administered if patient movement is of concern. Induced hypotension is often useful during IVM resection. Following resection, induced hypertension (e.g. 90 mmHg) may be requested to inspect hemostasis [2].

Brain Relaxation and adequate control of ICP were achieved with Hyperventilate to $PaCO_2$=~30 mmHg Limit isoflurane ≤ 1%. While Maintaining euvolemia. $PaCO_2$ →↓ cerebral vascular volume →↑ working space and lessens the need for vigorous retraction of brain tissue. ↓ $PaCO_2$ also improves the regional distribution of CBF by preferentially diverting blood to potentially ischemic areas of the brain [5].

If AVM is superficial, decreasing brain volume is less important, and the first four techniques listed (at left) are usually sufficient. If AVM is deep, additional listed therapies may be needed [3].

In the emergence period and at the start of dural closure, a propanol infusion (if used) was discontinued at the start of the scalp closure. The patient's BP generally will increase and titration of βadrenergic blocking drugs (e.g. labetalol or esmolol) and/or vasodilators (e.g. SNP) may be needed. The inhalation agents can be D/C'd at the time of dressing

application. Most patients will breathe spontaneously and can be extubated uneventfully while on the remifentanil infusion. If the brain has not been injured by the surgical procedure, the patient should awaken within 10 min after cessation of remifentanil administration [5].

Close regulation of BP during induction and before excision of AVMs is important, both to prevent bleeding (↑ BP) and to avoid ischemia 2° steal (↓ BP). After surgical excision is underway, however, modest decreases in MAP (≤ 20% below normal) using isoflurane, alone or in combination with esmolol and/or SNP, should be used to prevent excessive bleeding. Responses to vasoactive drugs are much easier to regulate if the patient is euvolemic [6,7].

Summary

Neuroanaesthesia is a dynamic and rapidly advancing sub-specialty where anesthetic technique can have a real impact on both operative conditions and patient outcomes. Advanced airway skills, multimodal monitoring, and the management of challenging and complex cases are required on a regular basis. And it is bringing physiology and pharmacology to life whilst working as part of a dedicated team when managing critically ill patients [8-10].

The goals of anesthesia for this operation are:

- Maintain optimum CPP (cerebral MAP minus cerebral venous pressure or ICP, whichever is greater), although it may be necessary to ↓ CPP rapidly if intracranial hemorrhage occurs during surgery
- Decrease intracranial volume (blood and tissue) to optimize working space for surgeons within the cranial compartment, thereby minimizing the need for surgical retraction of brain tissue
- Decrease metabolic rate and $CMRO_2$ with the expectation that the brain will tolerate hypotension and ischemia if sudden decreases in MAP and, hence, CPP become necessary

Close regulation of BP is essential. If the patient begins to cough on ETT, either it should be removed or cough reflex suppressed with iv lidocaine (0.5 mg/kg-1 mg/kg). The patient is placed in a bed in a 30° head-up position and transported to ICU for monitoring overnight. Supplemental O_2 should be administered and close regulation of BP maintained (typically at~10% below baseline values). Prophylactic antiemetics (e.g. metoclopramide 10 mg- 20 mg and ondansetron 4 mg) should be given 30 min before extubation.

Conclusion

Preintervention risk should always be minimized and blunted to avoid stroke severity and also to avoid irreversible ischemic damages. Additionally, preoperative routine medication with statins and b-blockers should be continued during the perioperative period and also propofol infusion should be considered to replace N_2O, Mannitol 0.5 g/kg-1 g/kg, Furosemide 0.3 mg/kg for better lumbar CSF drainage and brain relaxation.

Control of blood pressure is critical for this patient to have successful outcomes and progress and also to avoid the risk of postop hemorrhage. This is mainly because an acute ↑↑ BP →↑↑ transmural pressure across the aneurysmal wall → rupture of the aneurysm and of course body temperature should be maintained normothermic to have good recovery and progress.

References

1. Hashimoto, Tomoki, and William L. Young. "Anesthesia-Related Considerations for Cerebral Arteriovenous Malformations." *Neurosurg Focus* 11 (2001): 1-6.
2. Steinberg, Gary K., Steven D. Chang, Robert J. Gewirtz, and Jaime R. Lopez. "Microsurgical Resection of Brainstem, Thalamic, and Basal Ganglia Angiographically Occult Vascular Malformations." *Neurosurg* 2 (2000): 260-271.
3. Steinberg, GK, Stoodley MA "Surgical Management of Intracranial Arteriovenous Malformations. In Operative Neurosurgical Techniques, 4th Edition." *Schmidek HH, ed. WB Saunders, Philadelphia* (2000): 1363-1391.
4. Albala, D.M., J.W. Danaher, and W.T. Huntsman. "Ventriculoperitoneal Shunt Migration into the Scrotum." *Am Surg* 11 (1989): 685-688.
5. Jaffe, Richard A., Brenda Golianu, and Clifford A. Schmiesing, eds. "Anesthesiologist's Manual of Surgical Procedures. Lippincott Williams and Wilkins." *Neurosurg* (2014): 15-61.
6. Northfield, Douglas William Claridge, James Douglas Miller, and David Chadwick."Northfield's Surgery of the Central Nervous System. " *Blackwell Scientific Publications* (1987): 567.
7. Davidson, R.I. "Peritoneal Bypass in the Treatment of Hydrocephalus: Historical Review and Abdominal Complications." *J Neurol Neurosurg Psychiatry* 7 (1976): 640.
8. Alperin, Noam. "MRI Study of Cerebral Blood Flow and CSF Flow Dynamics in an Upright Posture: The Effect of Posture on the Intracranial Compliance and Pressure." *Acta Neurochir Suppl* 5 (2005): 177-181.
9. Rasmussen, Mads, Helle Bundgaard, and Georg Emil Cold. "Craniotomy for supratentorial brain tumors: risk factors for brain swelling after opening the dura mater." *J Neurosurg* 4 (2004): 621-626.
10. De Gray, L.C., and B.F. Matta. "Acute and Chronic Pain Following Craniotomy: A Review." *Anaesthesia* 7 (2005): 693-704.
11. How to cite this article Desta, Yilkal Tadesse, Kassaw Moges Abera. "Successful Anesthesia Management of Left Fronto-Temporal Craniotomy for Intracranial Vascular Malformation (IVM)" *J Clin Anesthesiol* 5 (2021): 6. doi: 10.37421/jcao.2021.5.6.

How to cite this article: Yilkal Tadesse Desta, Kassaw Moges Abera. "Successful Anesthesia Management of Left Fronto-Temporal Craniotomy for Intracranial Vascular Malformation (IVM)." J Clin Anesthesiol 5 (2021): 106.