Anaesthetic Management of a Patient with Subarachnoid Hemorrhage, Multiple Cerebral Aneurysms and Type IV Takayasu Arteritis

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Abstract

Takayasu's arteritis (TA), also known as pulseless disease, is a granulomatous panarteritis affecting large vessels, predominantly the aorta and its main branches. Twenty percent of TA cases present with central nervous system involvement. It typically manifests as cerebral ischemia or stroke, when central nervous system disease is present. There are rare reports of intracranial aneurysms in adults with TA. We report the anesthetic management of a 16-year old female patient with TA type IV with multiple cerebral aneurysm with subarachnoid hemorrhage.

Keywords
- cerebral aneurysm
- hypertension
- Takayasu arteritis

Introduction

Takayasu arteritis (TA) is a large vessel vasculitis.[1] Anesthesia for patients with TA is challenging due to severe hypertension and its effect on end-organs, vascular narrowing affecting distal circulation, and difficulties faced in arterial blood pressure monitoring. Twenty percent of TA cases present with central nervous system involvement, but intracranial aneurysms in patients with TA is rare. We describe anesthetic management of an adolescent female suffering from incidentally detected type IV TA and multiple cerebral aneurysms scheduled for aneurysmal neck clipping following subarachnoid hemorrhage (SAH).

Case Report

A 16-year-old female patient weighing 42 kg presented to our tertiary care hospital with complaints of sudden onset severe headache and vomiting followed by loss of consciousness for 3 hours. It was not associated with fever, seizure, or any trauma. She had suffered an episode of cerebrovascular accident at 8 years of age. On admission, her Glasgow Coma Score (GCS) was E2V2M5, pulse rate 66/min, noninvasive blood pressure (NIBP) in right arm 210/116 mm Hg, and respiratory rate 16/min, and bilateral pupils were 3 mm and equally reacting to light. Post resuscitation, her GCS improved to 15/15. The patient was then shifted for emergency noncontrast computed tomography (NCCT) brain, which revealed SAH. Urgent CT angiography of cerebral vessels was planned, which demonstrated left internal carotid artery (ICA) bifurcation aneurysm measuring 4.2 × 3.7 mm (neck 4 mm) and right communicating segment ICA aneurysm measuring 2.3 × 2.6 mm (neck 2.5 mm) (►**Fig. 1**) along with diffuse marked vasospasm. Hence, patient was posted for emergency craniotomy for aneurysmal neck clipping. Her preoperative blood investigations were within normal limits. Electrocardiograph showed left ventricular hypertrophy (LVH) with voltage criteria.

Preoperative NIBP in the right and left arms in supine position were 240/120 and 250/122 mm Hg, respectively. To our surprise, NIBP readings in the right and left lower limb (LL) were 90/60 and 94/62 mm Hg, respectively. As the possibility of coarctation of aorta (descending aorta narrowing) was raised, cardiology consultation was sought. We had suspected coarctation of aorta in this patient because of young age, multiple aneurysms, and discrepancy in lower and upper limb blood pressure. Limited transthoracic echocardiography

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Fig. 1 Left ICA bifurcation aneurysm measuring 4.2 × 3.7 mm (neck 4 mm) and right communicating segment ICA aneurysm measuring 2.3 × 2.6 mm (neck 2.5 mm). ICA, internal carotid artery.

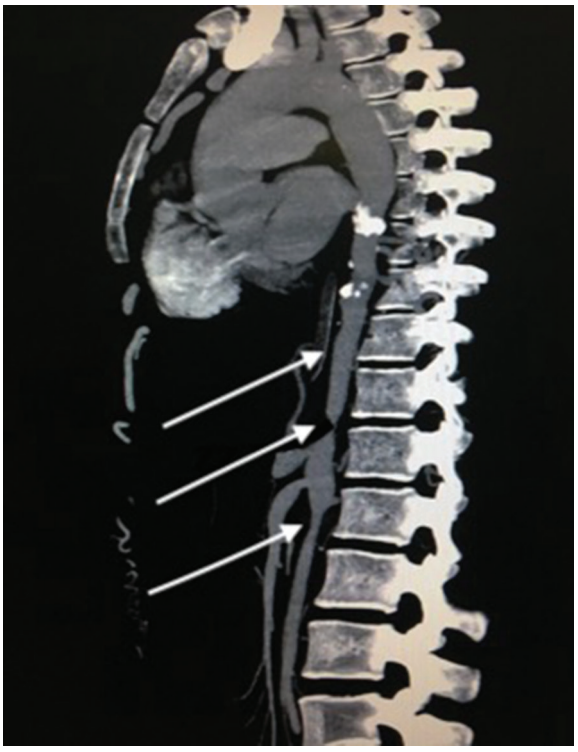

Fig. 2 The CT-angiography of thorax displayed concentric circumferential mural thickening with calcification involving distal arch, descending thoracic and abdominal aorta (TA type IV: chronic phase). Upper arrow: irregularities in outline and thickened wall of descending thoracic aorta. Middle arrow: mural thickening with severe stenosis proximal to origin of celiac artery. Lower arrow: mild mural thickening and narrowing involving infra renal aorta. CT, computed tomography; TA, Takayasu's arteritis.

was done in preoperative period, which showed presence of LVH. Keeping in mind emergent nature of surgery, it was decided to proceed for emergency clipping with the goals of maintaining cerebral hemodynamics, reducing intracranial pressure, and keeping lower limb mean BP of at least 70 mm Hg to avoid spinal cord ischemia.

In the operation theater, preinduction left radial artery was cannulated under local anesthesia for invasive BP monitoring, while BP in the right LL was monitored noninvasively. After preoxygenation, general anesthesia was induced with intravenous morphine 6 mg and propofol titrated to loss of verbal contact. Muscle relaxation was achieved using vecuronium 4 mg. Stress response of laryngoscopy and intubation was suppressed using bolus doses of intravenous esmolol. Right subclavian venous cannulation was done for central venous pressure (CVP) monitoring. Pin response was prevented by local pin site infiltration of injection of Xylocard. BP changes during skin incision, craniotomy, bone flap removal, and throughout the surgery were managed by titrated injection of nitroglycerine infusion. Anesthesia was maintained with a mixture of oxygen (50%) and nitrous oxide (50%) along with propofol infusion titrated to bispectral index (BIS) of 40 to 60 and intermittent boluses of vecuronium. Intraoperatively, her upper and lower limbs mean BP readings were targeted to 110 mm Hg and 70 mm Hg, respectively. Intraoperative period was uneventful, and both the aneurysms were clipped successfully.

Postoperatively, the patient was monitored and was mechanically ventilated in neurosurgical intensive care unit in view of intraoperative brain swelling. Bedside transthoracic echocardiography was performed, which showed concentric LVH and normal left ventricular systolic function. CT angiography of thorax displayed concentric circumferential mural thickening with calcification involving distal arch, descending thoracic, and abdominal aorta (TA type IV: chronic phase) (►**Fig. 2**). She was started on multidrug oral antihypertensive therapy including telmisartan, amlodipine, prazosin, and clonidine.

On postoperative day (POD) 3, the patient developed delayed ischemic neurologic deficits for which NCCT of the head was done, which showed left middle cerebral artery territory infarct. She was tracheostomized in view of prolonged mechanical ventilation. The patient was discharged on POD14 with GCS of E4VTM6, right hemiplegia, and stable hemodynamics. On 3-month postoperative follow-up, she was conscious and oriented with no sensory or motor deficit.

Discussion

Takayasu's arteritis was first described by an Italian pathologist Gian Bathista Morgagni in 1761.[2] Takayasu disease was first described in 1908 by a Japanese ophthalmologist, Takayasu. The incidence of TA was found to be 2.6 new cases/million/year in the United States.[3] Females are predominantly affected, with the overall incidence being 85% of all affected. The disease has multiple etiological factors, such as tuberculosis, syphilis, streptococcal infection, rheumatic fever, collagen vascular disease, genetic factors, and hypersensitivity.

Takayasu's arteritis is graded on the presence of four major complications: hypertension, retinopathy, aneurysm

formation, and aortic regurgitation.[4] Our patient belonged to stage III as per Ishikawa's grading. Based on angiographic classification of TA, index case had stage IV disease.[5] Unlike other types of TA, type IV TA has feeble pulse in lower limbs, while pulse can be felt in upper limbs. This accidental finding in our patient led to modifications in hemodynamic goals (target mean BP) and monitoring (BP recordings in both upper and lower limbs, application of pulse oximetry in the lower limb).

Avoidance of hypertension is of paramount importance while managing such cases. Wide swings in BP can occur during craniotomy due to laryngoscopy, endotracheal intubation, pin insertion, skin incision, and dural opening. These surges may result in rupture of cerebral aneurysms, which were prevented in the index case by managing BP (using antihypertensive agents) and maintaining adequate depth of anesthesia.

Prevention of hypotension is equally crucial for end-organ protection. Cerebrovascular ischemia occurs in about one-third of these patients; hence, maintenance of cerebral perfusion pressure is of utmost importance. We recorded BP from both the upper and lower limbs during the perioperative period. The lower limb BP was considered significant to identify the spinal cord ischemia in our patient having suspected coarctation in descending aorta (later found to have TA type IV). We maintained target mean BP of at least 70 mm Hg as it was baseline mean BP in lower limbs. Similarly, lower limb was used for pulse oximetry monitoring for early identification of ischemia. CVP and systolic pressure variation measurements provided adequate information about cardiac preload and fluid status in our patient during the intraoperative period.

In addition to these considerations, patients with TA should be evaluated for clinical features suggestive of carotid involvement, such as dizziness and syncope on head extension and carotid bruit during preoperative visit. It is advisable to keep the head in a neutral position avoiding hyperextension of the head during laryngoscopy, which can lead to postoperative visual disturbances, vertigo, hemiparesis, and seizures.

Conclusion

To conclude, patients having multiple aneurysms should be suspected for presence of vasculitis such as TA. Meticulous execution of predetermined anesthesia plans and vigilant perioperative monitoring is warranted for the delivery of safe anesthesia in these patients.

Funding
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Conflict of Interest
None.

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