

Stent-Assisted Coiling of a Ruptured Supraclinoid Internal Carotid Artery Aneurysm in Tetralogy of Fallot Under Conscious Sedation

Tetralogy of Fallot (TOF) is the most frequent cyanotic congenital heart condition characterized by pulmonary artery stenosis, right ventricular hypertrophy, ventricular septal defect, and overriding aorta.^[1,2] Ruptured cerebral aneurysm and subarachnoid hemorrhage (SAH) may develop in TOF increasing the complicated condition. Advances in neuroimaging and endovascular neurosurgery have allowed early identification and treatment of cerebral aneurysms improving patients' outcomes and reducing life-threatening complications such as intracranial bleeding.^[3] To our knowledge, this is the first report that a ruptured supraclinoid internal carotid artery (ICA) aneurysm with concomitant unrepaired TOF was managed with stent-assisted coiling under conscious sedation, which was performed on 22, November, 2019. This patient consented to the procedure and this case was approved by the ethics committee of our hospital.

CLINICAL PRESENTATION

A 35-year-old female patient presented with severe headaches, nausea, and vomiting for 6 h. She was awake and able to provide some medical history despite being drowsy (Hunt and Hess grade I). Computed tomography scan showed acute SAH with blood inferior to the right frontal lobe [Figure 1]. Blood pressure was 134 mm Hg/82 mm Hg, and the heart rate was 76/min. The oxygen saturation was 76% (room air), and the hemoglobin was 22 g/L. The platelet count was $78 \times 10^9/L$. The electrocardiogram showed sinus rhythm, right axis deviation, and right ventricular hypertrophy. A transthoracic echocardiogram showed a decreased left ventricular chamber size with hyperdynamic systolic function, left ventricular ejection fraction >65%, enlarged right ventricle with interventricular septal flattening (consistent with right ventricular overload), and ventricular septal defect with the predominant right to left shunting and tricuspid regurgitation [Figure 2].

Diagnostic cerebral arteriography was performed through the right femoral artery, showed a 4 mm saccular aneurysm of the supraclinoid portion of the right ICA arising medially. The neck of the aneurysms was wide [Figure 3]. Because of the combined problems of the ruptured aneurysm and severe cardiac disease, the anesthesiologist suggested that general anesthesia was risky because of the heart disease.

An endovascular procedure under sedation with consciousness was planned for definitive treatment. She was administered with 300 mg aspirin and 300 mg clopidogrel 3 h before the procedure. The vital signs were monitored and remained stable during the procedure. The aneurysm was coiled (Orbit-3.5 mm × 7.5 cm; Axiom-2 mm × 6 cm; Axiom-2 mm × 4 cm; Axiom-2 mm × 4 cm; Axiom-2 mm × 2 cm) with a 3.5 × 20 LVIS stent (Microvention, USA) assistance. The estimated blood loss during the procedure was minimal (less than 10 mL), and the total intraoperative fluid intake was less than 500 mL of crystalloids. The patient remained hemodynamically stable during the procedure and did not require any vasopressor infusion. The total length of the procedure was 20 min. The postoperative course was unremarkable. The patient was discharged home on the day 7 after treatment.

DISCUSSION

The authors described the stent-assisted coiling of a ruptured supraclinoid ICA aneurysm in a patient with unrepaired TOF under conscious sedation. Using conscious sedation and maintenance of intraoperative hemodynamic stability led to successful perioperative management. In a population-based cohort, almost 7% of females and 9% of males patients with congenital heart disease experienced a stroke over the course of their adult life before reaching age 65 years.^[4] Thirty-day mortality was 5.1% for patients with ischemic stroke and 27.7% for those with hemorrhagic stroke.^[4]

Management of ruptured cerebral aneurysm is even more challenging in patients with congenital cardiac disease.^[5] Cardiac anomaly and aneurysmal rebleeding are both life-threatening complications that significantly increase mortality and worsen neurological outcomes. Neurosurgical clipping and endovascular coiling are widely known treatment options for cerebral aneurysms.^[3,6] Greater fluid shift and intraoperative bleeding associated with open neurosurgery would have increased the risk of fluid overload and intraoperative heart failure in TOF patient.^[5] Additionally, considerable blood loss and concomitant hypotension may require the use of intraoperative hemodynamic support such as systemic sympathomimetic drugs (e.g., norepinephrine),^[4] which in the setting of high pulmonary blood pressure may worsen right ventricle performance.

Endovascular repair of the cerebral aneurysm was considered the first treatment option in our patient. This approach may reduce the complexity of an open procedure, in which general anesthesia is needed and finally improve

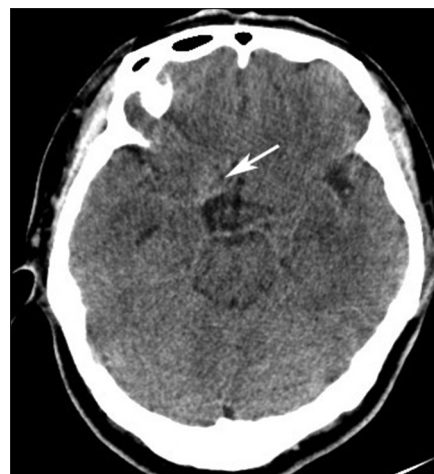


Figure 1: Computed tomography (CT) showing small amount of hemorrhage inferior the frontal right lobe (arrow)

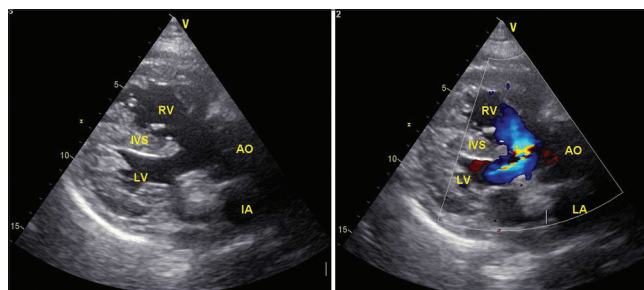


Figure 2: Preoperative transthoracic echocardiogram showing a membranous ventricular septal defect with predominant right to left shunting

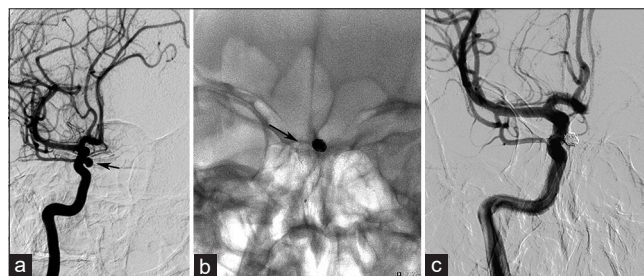


Figure 3: (a) Oblique view of an arteriogram of the right carotid artery showing a small saccular aneurysm arising medially from the supraclinoid portion. (b) The working angle view an arteriogram of the right carotid artery showing complete obliteration of the aneurysm. (c) Unsubtracted image shows the coil mass and the stent (arrow)

the overall outcome. Cerebral aneurysms that are simple with a small neck can be coiled simply. Considering complex aneurysms that do not have a defined neck, stent using can keep the coils into the sac and prevent occlude the parent vessels or its branches. In a recent systematic review, cardiac comorbidity was associated with complications from endovascular aneurysm treatment under general anesthesia.^[6] Nonoperated TOF patients suffer from chronic hypoxia and decreased pulmonary blood flow resulting in a considerable alteration in physiology, which is a challenge

for the anesthesiologist.^[5] Xiong *et al.* had reported their first experience of performing stent-assisted coiling and coronary artery stenting simultaneously under conscious sedation.^[7] Sorenson *et al.* demonstrated 68-year-old man of an unruptured, large, wide-necked, basilar apex aneurysm treated with stent-assisted coil embolization under conscious sedation because of history of coronary artery disease.^[8] Ramaswamy *et al.* described a large middle cerebral artery aneurysm was accessed and coiled by direct open exposure of the common carotid artery under conscious sedation and local anesthesia in a 61-year-old patient because of severe chronic obstructive airways disease.^[9] Advancement of neuroendovascular techniques has made treatment of this complex condition possible even under sedation.

CONCLUSION

Cerebral aneurysm coiling under conscious sedation could avoid intraoperative hemodynamic support and be useful in patients with congenital cardiac anomalies.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patients has given her consent for his images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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