# Stent-Assisted Coiling of Brain Aneurysms Under Conscious Sedation and Simultaneous Coronary Heart Disease Stenting: A New Concept

Atherosclerosis is the main cause of cerebral artery stenosis, dissection, and aneurysm and cardiovascular diseases.[1-7] In one study, 18,954 subjects underwent magnetic resonance angiography, in which 367 (1.93%) cases of coronary artery disease were independently associated with the presence of unruptured aneurysms.[4] Prevention and treatment of atherosclerosis is the fundamental of simultaneous treatment of cerebral and cardiovascular diseases, such as prevention and treatment of hyperlipidemia, hypertension, and diabetes.[3] Losing weight, quitting smoking, and adjusting dietary structure can be regarded as the prevention and treatment of atherosclerosis. These methods play a fundamental role in the treatment and prevention of coronary heart disease and stroke. This is the basis that we put forward the concept of "simultaneous treatment of cerebro- and cardiovascular diseases." Although there are few aneurysm coiling under sedation reports because of concomitant coronary artery disease, but they failed to report the concomitant coronary artery disease treatment in the same session.[8,9] Therefore, this is the first case of simultaneous interventional treatment for cerebral aneurysms and coronary heart disease under conscious sedation, which is performed on 13th April, 2019. This patient consented to the procedure and this case was approved by the ethics committee of our hospital.

## Case Presentation

A 61-year-old woman was evaluated for complaints of severe headaches, nausea, and vomiting for 6 h. Her CT examination was negative and lumbar puncture confirmed a subarachnoid hemorrhage. The patient had a history of repeated angina pectoris at rest within 2 weeks. Her neurological evaluation showed normal and Hunt-Hess grade was I. Brain MRA showed two small aneurysms of the bilateral internal carotid artery. An ejection fraction of 40% was reported by cardiac echocardiography examination. After right femoral artery puncture, cerebral angiography showed a 3 mm un-regular aneurysm of the posterior communicating artery segment of the left ICA and a 2 mm aneurysm of the supraclinoid portion of the right ICA arising medially and inferiorly. The neck of the aneurysms was wide. [Figure 1]. The cardiac team performed a cardiac angiogram for further evaluation before the aneurysm treatment. Coronary artery disease was noted with critical disease in the proximal segment of the right coronary artery with 85--90% stenosis of the midcircumflex artery. Because of the combined problems of ruptured aneurysm and severe cardiac disease, the intervention teams decided to do concomitant coiling of the aneurysms and coronary artery stenting procedures. The anesthesiologist suggested that general anesthesia was risky because of the heart disease. The interventions were performed under sedation with consciousness. The patient was premedicated with a loading dose of 300 mg aspirin and 300 mg clopidogrel per oral. The posterior communicating artery aneurysm was coiled with a 3.5 × 15 LVIS stent (Microvention, USA) assistance. The paraclinoid ICA aneurysm was treated with the same technique. After aneurysmal embolization, the patient was premedicated with another loading dose of 300 mg clopidogrel. The cardiovascular intervention team performed the coronary artery stenting (drug diluting stent, 2 stents of 2.75 × 38 mm and 1 stent of 2.5 × 40 mm, Medtronic, USA) [Figure 2]. The total procedure time was 80 min. Postoperatively, the patient did not develop any neurological deficits and she has returned to all her independent activities at 3-month follow-up.

## Discussion

Although the CT examination is negative, subarachnoid hemorrhage cannot be excluded because of the patient's symptoms and lumbar puncture confirmed the subarachnoid

hemorrhage. And coronary artery stenting needs high doses of anticoagulant and antiplatelet treatment, which will increase the aneurysm rupture risk.[10,11] Endovascular repair of the cerebral aneurysms was considered the first treatment option. This approach may reduce the complexity of an open procedure, where general anesthesia is needed and finally improves the overall outcome. Nakamizo *et al*.[10] analyzed 401 consecutive patients who had undergone craniotomy for unruptured aneurysms who received antiplatelet agents for coronary artery disease during the perioperative period and severe morbidity and intracranial hemorrhage occurred frequently in their 16.7% patients. In a systematic review, the use of anticoagulation was associated with complications from neurosurgical treatment of aneurysms.[11]

The decision to perform endovascular interventions was based on the severity of both conditions. Neurointervention using conscious sedation would be a reasonable way to allow coiling of the aneurysms rather than the risk of general anesthesia and surgical clipping. The patient had appreciable coronary artery disease and angina pectoris, the cardiovascular intervention team decided that coronary artery stenting was indicated. If the coronary after stenting is performed firstly, high doses of antiplatelet and anticoagulation treatment will increase the possibility of the aneurysm rupture. Both teams agreed that performing the interventions concomitantly would be the best and most efficient treatment approach for the patient. Yang *et al*. described this dilemma in a case report of a 21-year-old man who had coronary artery disease.[6] Cerebral angiogram showed incidental bilateral middle cerebral artery aneurysms. The cardiac team requested neurosurgeon to clip the aneurysms before a cardiac bypass grafting. The neurosurgeon responded that the patient should have myocardial revascularization before undertaking the risky neurosurgery. Although the cardiac bypass grafting was performed successfully, they failed to report the treatment of the aneurysms further.

Nowadays, advancement of neurointervention techniques have made treatment of this complex condition possible even under local anesthesia. Cerebral aneurysms that are simple with small neck can be coiled simply. Considering complex aneurysms that do not have a defined neck, using stent can keep the coils into the sac and prevent occlude the parent vessels or its branches. When a patient has severe cardiac disease in combination with complex cerebral aneurysms, the strategy should be balanced each other. In ruptured aneurysm, aneurysm should be handled prior to coronary artery disease. In unruptured aneurysm, if the coronary artery disease is a high risk for general anesthesia, the coronary artery disease will be treated firstly. In a recent systematic review, cardiac comorbidity was associated with complications from endovascular aneurysm treatment under general anesthesia.[11] Sorenson *et al*. demonstrated 68-year-old man of an unruptured, large, wide-necked, basilar apex aneurysm treated with neck reconstruction-assisted coil embolization under conscious sedation because he has 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]

Even at specialized medical centers, where treatment for complex aneurysms is common, no cardiovascular intervention is performed simultaneously. Craniotomy is contradiction for antiplatelet and anticoagulant therapy for coronary artery disease. Interventional treatment of cerebrovascular disease can overcome this contradiction. To perform simultaneous

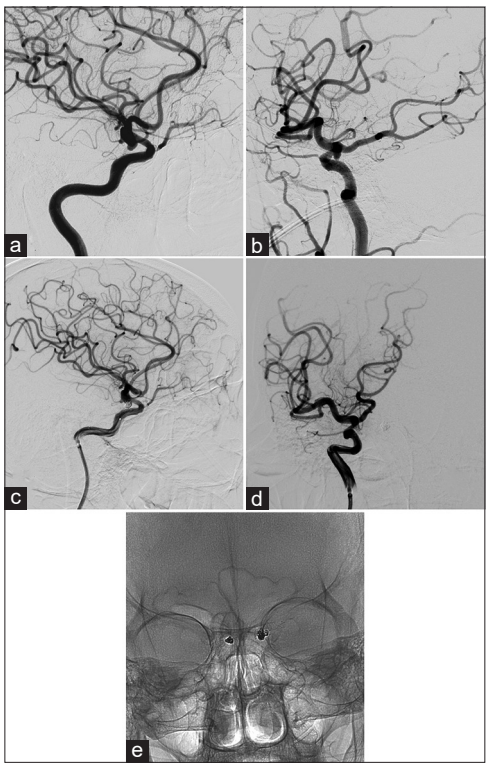


**Figure 1:** (a) Oblique view of an arteriogram of the left carotid artery shows a small globular aneurysm with an ill-defined neck. (b) oblique view of an arteriogram of the right carotid artery shows a small aneurysm with an ill-defined neck. (c) the working angle view an arteriogram of the left carotid artery shows complete obliteration of the aneurysm. (d) the working angle view an arteriogram of the right carotid artery shows complete obliteration of the aneurysm. (e) unsubtracted image shows the coil mass and stents

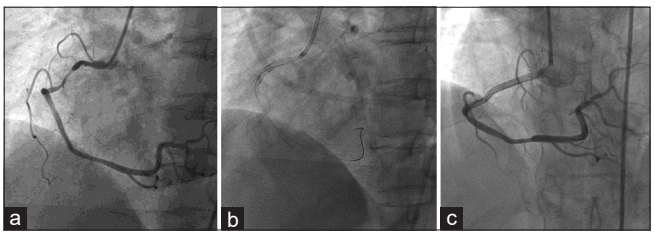


**Figure 2:** (a) An unsubtracted arteriography of the right coronary artery shows an 85% to 90% stenosis of the proximal right coronary artery. (b) unsubtracted image shows the stents. (c) an unsubtracted arteriography of the right coronary artery shows a normal caliber of the right coronary artery after stents placement

procedures, as described in this case, a high level of neurointervention experience and cooperation between two intervention teams is required. The occasion will be rare when a physician will encounter a patient who might benefit from simultaneous cardiovascular intervention and aneurysm coiling under patient with consciousness.

## Conclusion

This is the first report that describes the simultaneous interventions for complex cerebral aneurysm coiling and coronary artery stenting in the same session under sedation. Based on this case, we put forward the concept of "simultaneous intervention of cerebro- and cardiovascular diseases."

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names 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.

**Jianing Xiong, Lei Wang[1], Jian Tian, Yingqiang Li, Cuiling Gong[2], Xianli Lv[3]**

Departments of Neurosurgery, [1]Cardiology, and [2]Anesthesiology, Huantai People's Hospital, Huantai, Shandong, [3]Department of Neurosurgery, Beijing Tsinghua Changgung Hospital, School of Clinical Medicine, Tsinghua University, Beijing, China

**Address for correspondence:** Dr. Xianli Lv, Department of Neurosurgery, Beijing Tsinghua Changgung Hospital, School of Clinical Medicine, Tsinghua University, Beijing, Changping, Litang Road 168, Beijing - 102218, China.
E-mail: lvxianli000@163.com

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