Whole Cerebral Blood Flow Originating From Vertebral Arteries After Bilateral Internal Carotid Arteries Occlusion: A Case Report

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Abstract- Bilateral occlusion of internal carotid arteries is a rare condition usually associated with severe neurological symptoms. It is very uncommon finding among patients with ischemic stroke. In this article, we report a rare case of bilateral occlusion of internal carotid artery who presented with mild reversible neurological symptoms. Angiographic evaluation of her cerebral vasculature revealed no flow across the both cervical internal carotid arteries, but a run off through both posterior communicating arteries from the vertebrobasilar system. We performed a review of the pertinent literature and discussed different management option in these patients.

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Keywords: Cerebrovascular; Carotid occlusion; Stroke

Introduction

Common carotid artery (CCA) occlusion is a rare phenomenon with an incidence of 1-5% among stroke patients (1). Bilateral internal carotid artery occlusion (BICAO) is also very rare. Optimal treatment of these conditions is still controversial (2). Theoretically, severe cerebral ischemia in the territory of anterior circulation and severe neurological deficits are expected after BICAO. Nevertheless, Chang *et al*., after evaluation of 5400 carotid duplex ultrasonograms in patients with ischemic neurologic symptoms, reported that only 2.5% of them had complete internal carotid artery (ICA) occlusion (3). Shiao-Lin *et al*., reported just one case of bilateral common carotid artery occlusion after assessment of 812 angiograms over a 6-year period. In this article we report a patient with BICAO presenting with right hemiparesis and dysarthria (4).

Case Report

A 54-year-old lady presented with acute onset right hemiparesis and slurred speech without any other neurological problem. She had no history of hypertension, hyperlipidemia, and smoking, but a poor-controlled type II diabetes mellitus. On physical examination she had slurred speech and a right sided hemiparesia (3/5) was detected. Laboratory assessments only revealed elevated fasting blood sugar (264 mg/dl) and HbA1C (9.6%). Transcranial Duplex ultrasonography showed complete occlusion in left ICA and significant occlusion (>90%) in the right ICA.

Brain magnetic resonance imaging (MRI) revealed few foci of lacunar infarctions in both sides centrum semiovale, basal ganglia and acute infarction in the left internal capsule (Figure 1).

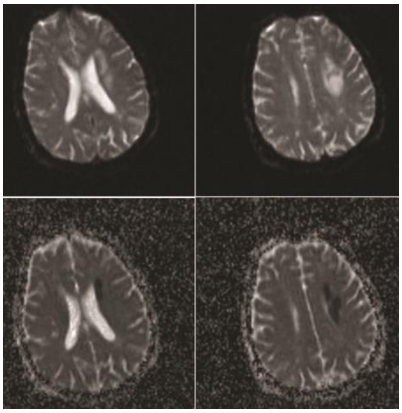

Figure 1. Diffusion weighted brain MRI. Acute infarction in left internal capsule and centrum semiovale was detected

MR angiography (MRA) revealed the complete occlusion of the bilateral ICAs (Figure 2). Digital

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subtraction angiography (Figure 3) confirmed the complete occlusion of the bilateral ICAs at their origins in the neck and revealed whole brain perfusion provided by the vertebrobasilar system through high flow shunts from posterior communicating arteries.

After admission, dual antiplatelet therapy with aspirin and clopidogrel was started. The slurred speech resolved completely and hemiparesis improved significantly (4/5), and the patient were discharged after about 10 days.

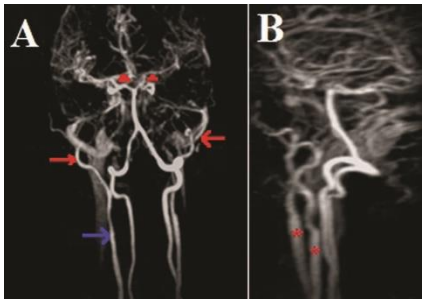

Figure 2. Brain and Cervical MR Angiography. A: Vascular anatomy of carotid and vertebrobasilar (VB) system is seen. Bilateral internal carotid occlusion (BICAO) is evident (the blue arrow: right CCA, red arrows: right and left ECA, red arrow heads point out to the remarkable shunt from VB system through the posterior communicating arteries to the supraclinoid carotid arteries). B: the red stars mark the CCAs; no flow is seen through ICAs bilaterally. The cerebral hemispheres are totally perfused via VB system

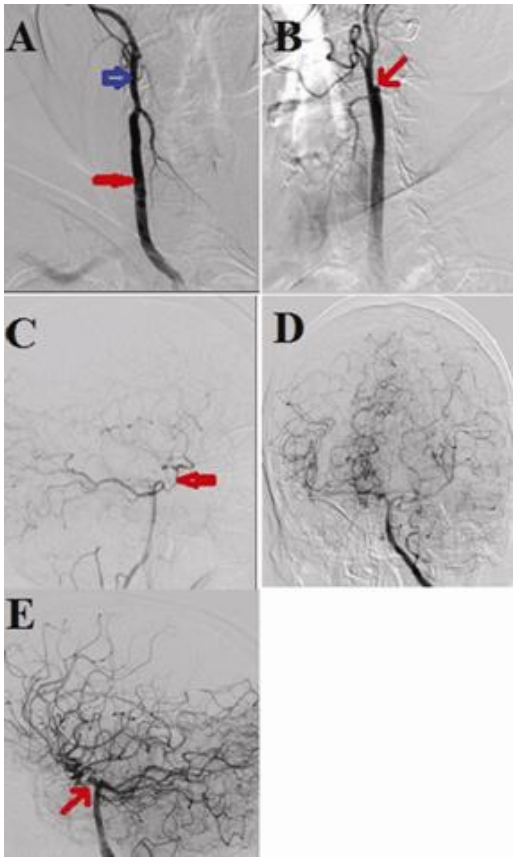

Figure 3. Brain and cervical Digital Subtraction Angiography (DSA). A: Right CCA (red arrow) and ECA (blue arrow) are seen without any flow into the ICA.B: Left common carotid artery, and external carotid artery are seen. The red arrow points out to the cut-off at the proximal part of the left ICA. C: Right vertebrobasilar (VB) system (AP view) is injected; the supraclinoid carotid is supplied via anastomosis through the posterior communicating artery. E: Left VB system (AP view) also supplies blood flow to the supraclionoid arteries. F: Left vertebrobasilar system injection. Extensive anastomosis to the blood vessels of both cerebral hemispheres is seen through large dominant posterior communicating arteries (Lateral view)

Discussion

According to our review, stroke was the most common clinical manifestation in both bilateral CCA occlusion (71%) and bilateral ICA occlusion (66%). Asymptomatic carotid occlusion is seen more frequently in unilateral (6%) than the bilateral occlusion (2.6%). After BICAO, collateral circulation is mainly dependent on the vertebrobasilar circulation (5-8). Other sources of collateral flow are the cross filling of the middle cerebral artery through the circle of Willis, an external carotid/ophthalmic anastomosis, or a combination of the two (7). Some studies were performed to evaluate the risk of recurrent stroke and mortality rate between medical and surgical groups in BICAO patients. According to them, the mortality rate in the surgical group was markedly higher than the medical group (30% versus 9.6% respectively) (5-7).

Recurrent stroke occurred less commonly after surgical treatment than medical therapy (10% versus 17.4% respectively). The results of these studies imply that medical therapy may be safer in terms of early mortality rate but in the long term follow up; surgery may significantly reduce the risk of recurrent stroke (5-9).

There are some known conditions that lead to BICAO including advanced atherosclerosis, moyamoya disease, radiation injury, trauma, and fibromuscular dysplasia (10-12).

BICAO due to moyamoya disease usually occurs at the distal end of ICA, and the vascular network at the skull base is obviously abnormal (13,14). In our patient, complete BICAO was observed at the origin, and the classic appearance of moyamoya disease was not present. She had no history of radiation, infection, and trauma but suffered from longstanding poor controlled diabetes mellitus. Thus, the major underlying condition in our patient seems to be atherosclerosis. Compensation after BICAO varies among individuals and because of that, symptoms also vary from person to person from no symptoms to fatal stroke (15,16). The Exact treatment of BICAO is not clear to date. Persoon *et al*., evaluated the BICAO patients from 1990 to 2007 and reported that pharmacotherapy alone had a favorable prognosis (17). Lai *et al.*, also reported that BICAO patients who were treated with pharmacotherapy had no recurrence during 2 years follow-up (19). Some other studies showed higher rate of mortality in surgical group, but on the other hand, the recurrence rate was lower after surgical treatment (19). One study assessed the effect of extracranial-intracranial (EC-IC) bypass on the improvement of cognitive function in patients with the extracranial carotid occlusive disease after 2 years follow-up. This study failed to show any superiority of EC-IC to improve cognitive outcome in comparison with medical therapy (20). We suggest that younger patients with unstable and progressive neurologic symptoms and those who are at a higher risk of recurrent stroke be considered for surgical revascularization. Patients with mild and improving symptoms (such as our patient) have a lower risk of recurrent stroke and could be considered for long term medical therapy (17, 18, and 21). PET scan is a good imaging modality for a baseline evaluation of cerebral blood flow and metabolism rate of the apparently ischemic brain regions in patients with BICAO (2). It may also be able to monitor the severity of cerebral ischemia during follow up after initiation of medical therapy.

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