

## Bilateral common carotid occlusion without neurological deficit

Serdar Karaköse,<sup>1</sup> Aydin Karabacakoglu<sup>1</sup> and Hasan Solak<sup>2</sup>

Departments of <sup>1</sup>Radiology and <sup>2</sup>Cardiothoracic Surgery, Selçuk University, Konya, Turkey

### SUMMARY

A 40-year-old man presented with pain and numbness in his right arm. On his clinical examination, no neurological deficit was found. Bilateral common carotid artery duplex sonography scan demonstrated no flow in either lumen. No abnormality was recognized on brain CT. On cerebral digital subtraction angiogram, total occlusion of the brachiocephalic trunk and left carotid artery were shown. There was a modest stenosis in the left vertebral artery. Collateral circulation feeding the intracranial carotid system mainly originated from the left vertebrobasilar system. Previous cases of bilateral carotid occlusion are reviewed and discussed.

**Key words:** angiography; bilateral common carotid artery; occlusion.

### INTRODUCTION

Occlusion or severe stenosis of extracranial vessels might lead the hypoperfusion without overt infarction of brain tissue.<sup>1</sup> Cases of carotid occlusions have often been reported in the literature, but most of them were related to bilateral internal carotid occlusion. Bilateral common carotid artery occlusion appears to be rare.<sup>2</sup>

The natural history of patients suffering from bilateral common carotid occlusion is poorly known. Cardiovascular risk factors, such as smoking, are frequently found. Presenting neurological episodes have been included as either transient ischaemic attack or stroke. Collateral circulation feeding the intracranial carotid system mainly, or exclusively, originated from the vertebrobasilar system. Common carotid artery occlusions are frequently detected by colour Doppler ultrasonography and/or angiography.<sup>2–4</sup>

We present a patient with bilateral common carotid artery and right vertebral artery occlusions without neurological deficit.

### CASE REPORT

A 40-year-old man presented with pain and numbness in his right arm for the previous 3 months. In this period, he had had

two transient ischaemic attacks. He was a tobacco user for 15 years. On his clinical examination, there were no pulses in either common carotid artery or the right axillary, brachial, radial or ulnar arteries. No neurological deficit was found. Biochemistry and haematological laboratory values were normal.

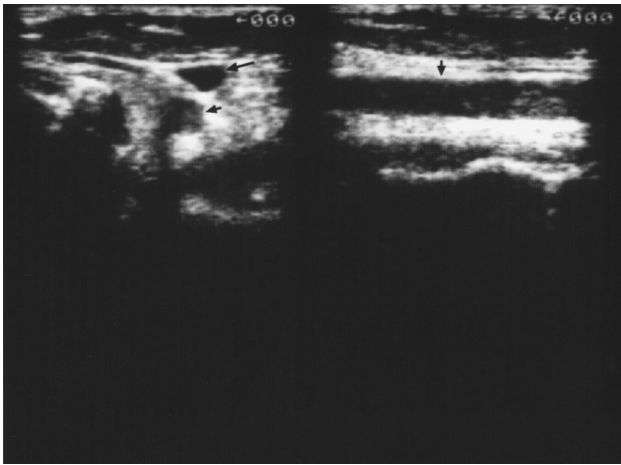
The lumens of both common carotid arteries were filled with thrombus that was shown initially by ultrasonographic examination (Fig. 1). No flow was seen in either common carotid artery on colour Doppler ultrasonography. Normal flow patterns were seen in internal jugular veins (Fig. 2). No abnormality was recognized on contrast-enhanced cranial CT. In arch aortography, the left subclavian artery was normal but the brachiocephalic trunk and the left common carotid artery were occluded (Fig. 3a). During arch aortography in the late arterial phase, the right subclavian and right vertebral arteries were faintly filled with contrast via collaterals (Fig. 3b). Selective left subclavian DSA showed 40% stenosis of the proximal part of the left vertebral artery, just near the bifurcation. Blood flow was normal in the left subclavian artery and the distal part of the left vertebral artery (Fig. 4). In superselective DSA of the left vertebral artery, the distal part of the left vertebral artery, basilar artery and posterior cerebral arteries were normal. Bilateral anterior and middle cerebral arteries and their branches were visualized

S Karaköse MD; A Karabacakoglu MD; H Solak MD.

Correspondence: Serdar Karaköse, Department of Radiology, Selçuk University, Konya 42080, Turkey.

Email: radserkar@hotmail.com

Submitted 10 December 2001; accepted 15 July 2002.



**Fig. 1.** Left common carotid ultrasonography. The lumen of the common carotid artery was filled with thrombus (short arrows). The lumen echogenicity of common carotid artery was higher than the internal jugular vein (long arrow).

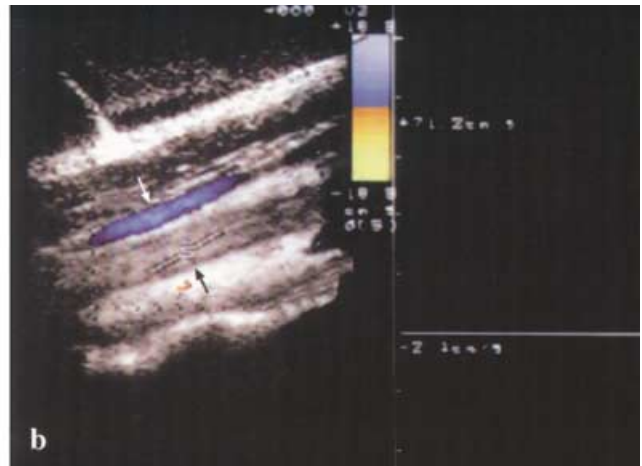
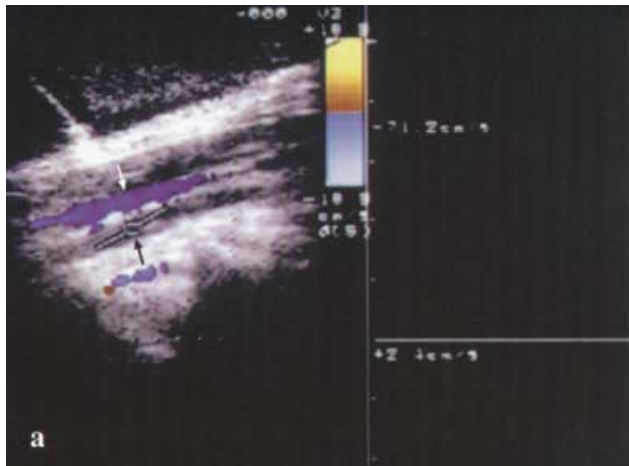
faintly during left vertebral angiography (Fig. 5). Collateral circulation feeding the intracranial carotid system mainly originated from the left vertebrobasilar system.

Left common carotid embolectomy and a brachiocephalic trunk 'Y' graft were performed surgically. The specimens that were taken from the vessel lumens were examined histopathologically and were organized thrombi.

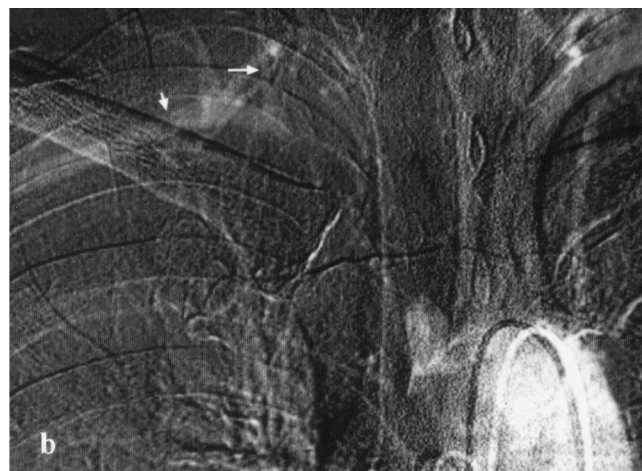
## DISCUSSION

The external carotid and vertebrobasilar system are the main collaterals for supplying the brain perfusion when both internal carotid arteries are occluded.<sup>5-7</sup> In most of these cases, neurological deficits are present.

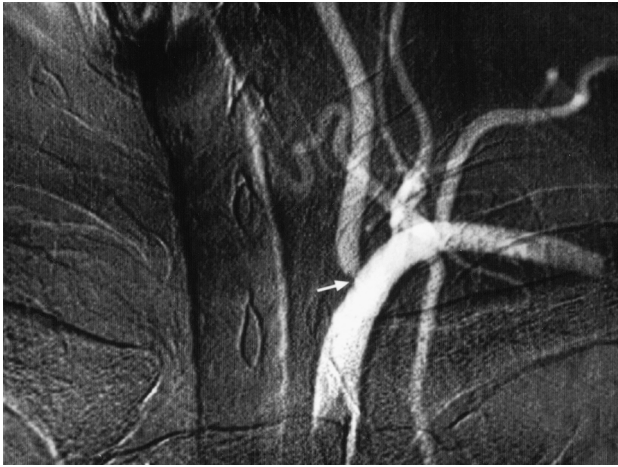
De Graeve described the ocular ischaemic syndrome that is characterized by ocular symptoms and signs secondary to bilateral occlusion of the carotid artery.<sup>8</sup> Lambrecht reported a case of bilateral occlusion of the internal carotid arteries



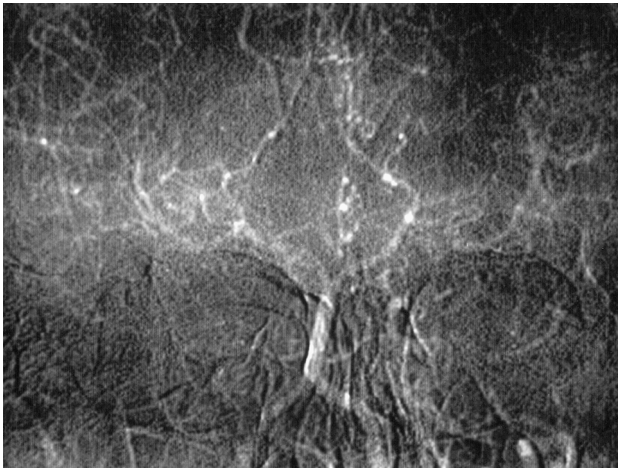
**Fig. 2.** (a) Right and (b) left common carotid artery colour Doppler ultrasonography. No flow was seen in either common carotid artery (black arrows). Normal flow patterns were seen in internal jugular veins (white arrows).



**Fig. 3.** Arch aortography. (a) Left subclavian artery was normal but the brachiocephalic trunk (short arrow) and left common carotid artery (long arrow) were occluded (b). The right subclavian (short arrow) and right vertebral artery (long arrow) visualized faintly in the late arterial phase.



**Fig. 4.** Selective left subclavian angiography. Forty percent stenosis was seen at the proximal part of the left vertebral artery (arrow) just near the bifurcation. Blood flow was normal in the left subclavian artery and in the distal part of the left vertebral artery.



**Fig. 5.** Superselective left vertebral artery angiography. The distal part of the left vertebral artery, basilar artery and posterior cerebral arteries were normal. Bilateral anterior and middle cerebral arteries and their branches were visualized faintly during left vertebral angiography.

presenting with right hemiparesis and hypoesthesia, associated to meningovascular syphilis in a patient with AIDS.<sup>9</sup>

AbuRahma described bilateral internal carotid artery occlusion in 21 patients who were suffering from hemispheric transient ischaemic attack, amaurosis fugax, stroke or non-hemispheric transient ischaemic attack. The diagnosis was confirmed using carotid duplex ultrasound and angiography. The majority of patients had more than one risk factor for atherosclerosis, such as smoking, hyperlipidaemia, hypertension, coronary artery disease and diabetes mellitus. In addition to the usual medical treatment, 13 patients underwent surgical intervention.<sup>10</sup>

Sottiurai presented a patient with bilateral internal carotid occlusion and concomitant vertebral artery stenosis who had lateralized amaurosis fugax, syncope and partial visual field defect resolved by surgical and radiological interventions.<sup>11</sup>

Catala reported a study of 19 patients with bilateral occlusion of the internal carotid arteries that were demonstrated by angiography. In these patients, smoking was particularly frequent (95%). Presenting neurological episodes included either transient ischaemic attack (8/19) or stroke (9/19).<sup>12</sup> Their results confirmed that the patients suffering from atheromatous bilateral occlusion of the internal carotid arteries might survive with minimal neurological deficits.

Wroblewski discussed a case of a 46-year-old man with bilateral internal carotid artery and right vertebral artery occlusion in an unexpected good clinical state. The clinical diagnosis was documented by angiographical and Doppler findings and brain CT scan.<sup>13</sup>

Bilateral common carotid occlusion has been reported rarely in the literature. In recent years, most of the articles related to bilateral common carotid artery occlusion dealt with experimental studies.

Rats and gerbils have been widely used to investigate the molecular mechanism of selective neuronal death following global ischaemia due to bilateral common carotid occlusion.<sup>14</sup> Uehara *et al.* described hypoxic-ischaemic brain injury and periventricular leukomalacia in neonatal rats with bilateral carotid artery occlusion. Periventricular leukomalacia is an important cause of cerebral palsy and is characterized by cysts and coagulation necrosis in the periventricular white matter.<sup>15</sup>

Yamaguchi *et al.* described a 68-year-old woman who had become unconscious suddenly because of simultaneous bilateral common carotid artery occlusion that was shown by cerebral angiography and a normal CT scan. She died on the eleventh day after hospitalization. From the autopsy findings, they considered that this case was one of simultaneous bilateral common carotid occlusion due to cardiogenic thrombi.<sup>2</sup>

Maier documented a case of a patient who became deeply unconscious due to complete obstruction of both common carotid arteries caused by near-suicidal hanging. After surgical repair of blunt carotid lesions, the neurological deficits regressed and the patient had a good outcome.<sup>3</sup>

Zbornikova treated three patients with modest neurological deficit and bilateral occlusion of the common carotid arteries and during follow up, none of these patients had a new stroke.<sup>4</sup>

Bilateral common carotid artery, right vertebral artery occlusions and concomitant vertebral artery stenosis were identified in our patient who had no neurological deficit. There was no history of hypertension, hyperlipidaemia, signs of systematic arteriosclerosis or vasculitis, and an unremarkable family history for vascular abnormalities, but he was a smoker. After surgical intervention, our patient had a good outcome.

Kluytmans determined that dynamic susceptibility contrast-enhanced MRI could enable the measurement of relative haemodynamic changes in patients with internal carotid artery occlusions with the advantage that grey and white matter perfusion could be distinguished.<sup>16</sup>

Okada visualized four vessel occlusions of cerebral arteries by MR angiography in two patients. The diagnosis was confirmed by conventional angiography. Additionally, conventional angiography demonstrated the extensive collateral vessels.<sup>17</sup>

Angiography is the gold standard in the diagnosis of carotid artery occlusions.<sup>2,8-15</sup> In some cases with bilateral carotid artery occlusion, MR and CT images can be normal or unspecific.<sup>2,12,13,16</sup>

Our results confirm that the patients suffering from bilateral occlusion of the common carotid arteries might survive without neurological defects. Collateral circulation is mainly provided by the vertebrobasilar system, allowing maintenance of normal cerebral perfusion.

## REFERENCES

1. Van der Grond J, Balm R, Kappelle LJ, Eikelboom BC, Mali WP. Cerebral metabolism of patients with stenosis or occlusion of the internal carotid artery. A 1H-MR spectroscopic imaging study. *Stroke* 1995; **26**: 822–8.
2. Yamaguchi S, Oki S, Ogasawara H, Sato H, Ito Y, Hibino S. A case of simultaneous bilateral carotid occlusion. *No Shinkei Geka* 1997; **25**: 247–51.
3. Maier W, Fradis M, Malatskey S, Krebs A. Diagnostic and therapeutic management of bilateral carotid artery occlusion caused by near-suicidal hanging. *Ann Otol Rhinol Laryngol* 1999; **108**: 189–92.
4. Zbornikova V, Vorstrup S, Ryding E. Bilateral common carotid artery occlusion with minimal neurological deficit: long-term follow up in 3 patients. *Neurol Res* 1996; **18**: 109–16.
5. Tachibana E, Suzuki Y, Harada T, Saito K, Gupta SK, Yoshida J. Bypass surgery using a radial artery graft for bilateral extracranial carotid arteries occlusion. *Neurosurg Rev* 2000; **23**: 52–5.
6. Berguer R, McCaffrey JF, Bauer RB. Bilateral internal carotid artery occlusion. Its surgical management. *Arch Surg* 1980; **115**: 840–3.
7. Grobovschek M. Bilateral occlusion of the cervical internal carotid arteries: a case with an unusual co-lateral circulation. *Neuroradiology* 1979; **15**: 275–7.
8. De Graeve C, Van de Sompel W, Claes C. Ocular ischaemic syndrome: two case reports of bilateral involvement. *Bull Soc Belge Ophthalmol* 1999; **273**: 69–74.
9. Lambrecht F, De Sa DS, Koerbel A *et al.* Internal carotid bilateral occlusion, meningovascular syphilis and AIDS: case report. *Arg Neuropsiquiatr* 1999; **57**: 311–6.
10. AbuRahma AF, Copeland SE. Bilateral internal carotid artery occlusion: natural history and surgical alternatives. *Cardiovasc Surg* 1998; **6**: 579–83.
11. Sottiurai VS. Management of symptomatic bilateral internal carotid artery occlusion and vertebral artery stenosis. *Int Angiol* 1991; **10**: 100–2.
12. Catala M, Rancurel G, Raynaud C, Leder S, Kieffer E, Koskas F. Bilateral occlusion of the internal carotid arteries. Analysis of a series of 19 patients. *Rev Neurol* 1995; **151**: 648–56.
13. Wroblewski L, Korzeniewska A, Barycki J. A case of bilateral internal carotid artery and right vertebral artery occlusion. *Neurol Neurochir Pol* 1997; **31**: 601–6.
14. Yang G, Kitagawa K, Matsushita K *et al.* C57BL/6 strain is most susceptible to cerebral ischemia following bilateral common carotid occlusion among seven mouse strains: selective neuronal death in the murine transient forebrain ischemia. *Brain Res* 1997; **752**: 209–18.
15. Uehara H, Yoshioka H, Kawase S *et al.* A new model of white matter injury in neonatal rats with bilateral carotid artery occlusion. *Brain Res* 1999; **837**: 213–20.
16. Kluytmans M, van der Grond J, Viergever MA. Gray matter and white matter perfusion imaging in patients with severe carotid artery lesions. *Radiology* 1998; **209**: 675–82.
17. Okada Y, Shima T, Nishida M, Kagawa R. Magnetic resonance angiography visualization of four vessel (bilateral carotid and vertebral artery) occlusion – two case reports. *Neurol Med Chir* 1998; **38**: 28–33.