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Atypical Common Carotid Artery Diaphragm With an Accompanying Aneurysm

Yumei Liu, MD, Yang Hua, MD*, Chen Ling, MD, Na Lei, MD, and Wuwei Feng, MD, MS

Department of Vascular Ultrasound, Xuanwu Hospital, Capital Medical University, Beijing, Peoples Republic China

Carotid diaphragm was first described in 1967 by Ehrenfeld et al¹ It is also described with several other names—fibromuscular hyperplasia, atypical fibromuscular dysplasia, atypical fibromuscular hyperplasia, septa, pseudovalvar fold, diaphragm or webs.² Carotid diaphragm can cause artery stenosis primarily affecting the internal carotid artery (ICA) beyond the bulb segment. It usually occurs in young or middle-aged individuals.³ The onset of symptoms typically begins with syncopal spell, tinnitus and ischemic stroke.⁴ Although more than 50 cases have been reported in which all lesions showed as stenosis located in the ICA, in this article, we report a unique common carotid artery (CCA) diaphragm with an accompanying aneurysm.

A 24-year-old Chinese, nonsmoking male, was hospitalized for recurring lightheadedness in the past year. He had no medical history of hypertension, diabetes, coronary heart disease, dyslipidemia or trauma. There was no family history of cerebrovascular disease. Physical examination did not find any neck mass. The transthoracic echocardiography examination showed normal results. Carotid duplex ultrasound (CDU) showed 2 carotid diaphragms located in the left proximal and middle CCA, respectively (Figure A). High peak systolic velocities of 364 cm/second were detected at the level of proximal carotid web (Figure B), suggesting a significant stenosis of 70–99%. An aneurysmal dilatation with approximately 4 cm length was also detected at the lesion. Subsequently, it was confirmed by computed tomography angiography (CTA) (Figure D) and digital subtraction angiography (DSA) (Figure E). A 50 mm × 9 mm stent (Viabahn stent, GORE) was inserted (Figures C and F) and the patient's symptoms resolved shortly (Figure C). On the follow-up visit after 12 months, the patient experienced no recurrent neurologic effects, and repeated CDU detected no in-stent restenosis.

Carotid diaphragm pathology resulting from surgical procedures has been reported as intimal fibroplasias without atherosclerotic ridge.⁴ Additionally, thrombi have been reported in several cases.⁴ Given the nonatherosclerotic and noninflammatory histopathology, carotid diaphragm has been considered as a subtype of fibromuscular dysplasia (FMD). FMD is a vascular disease of the musculature in the arterial wall that leads to aneurysm, dissection, stenosis or even occlusion. Neurologic deficits are typically caused by cerebral ischemia.

* dryanghua99@163.com.

Patients with carotid diaphragm tend to have elevated risk of recurrent embolic stroke resulting from the locally formed thrombi.⁴

Carotid diaphragm has been reported to occur mainly in the ICA and the vertebral artery.² If located in the ICA, all carotid diaphragms were typically in the carotid bulb or in the proximal-to-middle segment of the artery. Only one case report of ICA web with 2 carotid diaphragms has been reported.⁵ The remaining reported cases are isolated carotid diaphragms. This unique case displayed 2 carotid diaphragms in the proximal and in the middle of CCA. McNamara⁶ considered carotid diaphragm as a rare carotid developmental anomaly. The primitive aorta consists of 6 paired branchial arches that developed between the ventral and dorsal aortal segments. The abnormal development of these arteries may cause CCA regression or other arterial malformations. FMD usually involves the proximal to the distal portion of the ICA. It can be easily distinguished from congenital vascular anomalies. This patient had normal anatomy comprising extracranial and intracranial arteries without dysplasia. This type of carotid diaphragm is considered as a subtype of FMD as opposed to a vascular anomaly.

Most carotid diaphragms reported earlier were initially diagnosed by DSA. Carotid diaphragm images have been described as cleft-like structures, translucent endoluminal web-like or linear filling defects. In addition, it was described as a shelf-like hypodense projection on CTA with an irregular, noncharacteristic filling on magnetic resonance angiography. Noninvasive imaging modality frequently fails to detect carotid diaphragm due to low threshold for detection.² In such cases, carotid diaphragms can inadvertently be overlooked even by DSA.⁵ The characteristic of ultrasound finding is described as a wedge-shaped mass, a membranous appearance or a linear band tissue.⁷ In this case report, we described an unusual carotid diaphragm with lumen stenosis and accompanying aneurysm in the left CCA that was detected by CDU first. The opening direction complied with the blood flow direction. An aneurysmal dilatation occurred at the lesion level such that it may have caused the misdiagnoses of CTA for the carotid diaphragms. Aneurysm is not common in the extracranial carotid artery caused by the carotid diaphragm.

Management of carotid diaphragm varies depending on the specific symptoms of patients. Medical therapy with antiplatelet (aspirin or clopidogrel bisulfate) is typically used for asymptomatic patients.² Carotid endarterectomy has been proposed as a treatment for several symptomatic patients.³ Carotid artery stenting has also been reported as an alternative treatment in 2 cases.^{2,5} For this patient, the anatomic aneurysm location in the proximal to the middle of CCA increased the technical difficulty of a carotid endarterectomy operation. Carotid artery stenting was performed successfully without any periprocedural complications.

In conclusion, we presented an unusual CCA case of 2 carotid diaphragms with an accompanying aneurysm, first detected by CDU and subsequently confirmed by CTA and DSA. To our knowledge, this is the first reported CCA diaphragm that is also possible FMD. Additionally, this is the fourth reported ultrasound diagnosed case of carotid web in the literatures. This case extends the recognized ultrasound features of carotid diaphragm, and clinicians can be more mindful with such ultrasound findings in the future.

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References

1. Ehrenfeld WK, Stoney RJ, Wylie EJ. Fibromuscular hyperplasia of the internal carotid artery. *Arch Surg.* 1967; 95:284–7. [PubMed: 16097301]
2. Lenck S, Labeyrie MA, Saint-Maurice JP, et al. Diaphragms of the carotid and vertebral arteries: an under-diagnosed cause of ischaemic stroke. *Eur J Neurol.* 2014; 21:586–93. [PubMed: 24447601]
3. Joux J, Chausson N, Jeannin S, et al. Carotid-bulb atypical fibromuscular dysplasia in young Afro-Caribbean patients with stroke. *Stroke.* 2014; 45:3711–3. [PubMed: 25358695]
4. Morgenlander JC, Goldstein LB. Recurrent transient ischemic attacks and stroke in association with an internal carotid artery web. *Stroke.* 1991; 22:94–8. [PubMed: 1987677]
5. Lenck S, Labeyrie MA, Mosimann PJ, et al. Diaphragm of the internal carotid artery: a novel cause of pulsatile tinnitus. *J Neurol.* 2013; 260:2185–7. [PubMed: 23881106]
6. McNamara MF. The carotid web: a developmental anomaly of the brachiocephalic system. *Ann Vasc Surg.* 1987; 1:595–7. [PubMed: 3333009]
7. Fu W, Crockett A, Low G, et al. Internal carotid artery web: doppler ultrasound with CT angiography correlation. *J Radiol Case Rep.* 2015; 9

FIGURE.

A, Color duplex ultrasound demonstrated 2 diaphragms in the left CCA with an accompanying aneurysm. B, Color duplex ultrasound showed severe stenosis. The peak velocity was 364 cm/second and the diastolic velocity was 64.1 cm/second. C, Color duplex ultrasound showed normal velocity with stent placed in the CCA. The peak velocity recovered to 107 cm/second and the diastolic velocity was 24.7 cm/second. D, CTA illustrated a septum-like hypodense projection in the lumen with an aneurysm at the left proximal CCA. E, DSA confirmed the finding of stenosis accompanying aneurysm. F, DSA showed that a stent was successfully placed without residual stenosis. CCA, common carotid artery; CTA, computed tomography angiography; DSA, digital subtraction angiography.