INTRODUCTION

The normal course of the common carotid arteries (CCA) and internal carotid arteries (ICA) is in the parapharyngeal space, along the carotid sheath. Although differences in terms of shape are frequent (20%-60%) and have been already reported [1,2], partial or total carotid anatomic variations remain very rare. Among these, a particular aberrant course, also called “kissing carotids” when bilateral [3], occurs when the carotid artery is deviated medially in the retropharyngeal space, ahead of the vertebral bodies and behind the airways.

We report this extremely rare condition in a 95-year-old woman with bilateral retropharyngeal course of carotid arteries, who arrived with sudden onset of confusion, disorientation, dizziness and with bilateral clonic jerking of the upper limbs.

CASE

A 95-year-old woman presented to our emergency department for recent onset of confusion and disturbance of time and space perception. Short-term upper limb clonus was also reported. The patient had a medical history of previous coronary angioplasty and stenting for coronary heart disease four years before, chronic gastritis and hiatal hernia, diverticulosis, hyperuricemia and bilateral osteoarthritis of the temporo-mandibular joints.

On examination, blood pressure was 180/60 mmHg, heart rate was 99 bpm and oxygen saturation was 99% in room air with respiratory rate of 18 bpm.

Neurological examination revealed left tongue deviation...
Aortic trunk CT angiography (CTA) was obtained (Fig. 1, 2), showing a bovine aortic arch with right-side deviation of the esophagus and airways. The left CCA had an S-shape double kinking course with medialization at the level of the fifth cervical vertebral body. The right CCA also had an S-shape course with medialization at the level of the first costovertebral joint. After the CCAs’ straight retropharyngeal course (kissing carotid tract, Fig. 3), carotid bifurcations took place at the level of the second cervical vertebral body, with progressive lateralization of the ICAs to the base of the skull. Furthermore, 40% right CCA stenosis, 30% right ICA stenosis and 80% left ICA stenosis (The North American Symptomatic Carotid Endarterectomy Trial criteria) were discovered. The anatomical courses of the other arterial and venous vessels resulted normal.

During hospitalization, the patient remained completely asymptomatic. Tongue deviation recovered, as well as confusion and spatial and temporal disorientation. According to the advanced patient’s age, comorbidities, absence of symptoms and the challenging anatomy, endovascular or surgical corrections of the left ICA stenosis were rejected. At discharge, clopidogrel 75 mg daily and with muscle strength of the limbs fully preserved.

She was taking aspirin 100 mg once daily, rifamycin, allopurinol and antihypertensive therapy with enalapril, bisoprolol and isosorbide mononitrate.

Blood tests showed just an impaired renal function (creatinine 1.47 mg/dL with an estimate glomerular filtration rate of 21 mL/min). Electrocardiogram did not reveal any particular problem, as well as the echocardiogram which showed only moderate concentric hypertrophy with preserved systolic function, mild mitral regurgitation and aortic valve sclerosis. Brain computed tomography (CT) scan resulted negative.

After have administered rehydration, acetylsalicylic acid and isosorbide mononitrate, the patient was admitted conscious and well oriented but with persistent tongue deviation.

A second brain CT scan, performed 24 hours after the beginning of symptoms, showed an ischemic injury in the left frontal cortex. Doppler ultrasound (DUS) demonstrated an abnormal anatomy of the CCAs with suboptimal imaging of the carotid bifurcations. Therefore, after hydration to prevent contrast media damage, supra-aortic trunk CT angiography (CTA) was obtained (Fig. 1, 2), showing a bovine aortic arch with right-side deviation of the esophagus and airways. The left CCA had an S-shape double kinking course with medialization at the level of the fifth cervical vertebral body. The right CCA also had an S-shape course with medialization at the level of the first costovertebral joint. After the CCAs’ straight retropharyngeal course (kissing carotid tract, Fig. 3), carotid bifurcations took place at the level of the second cervical vertebral body, with progressive lateralization of the ICAs to the base of the skull. Furthermore, 40% right CCA stenosis, 30% right ICA stenosis and 80% left ICA stenosis (The North American Symptomatic Carotid Endarterectomy Trial criteria) were discovered. The anatomical courses of the other arterial and venous vessels resulted normal.

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![Image](https://via.placeholder.com/150)

**Fig. 1.** Anomalous anatomic relations between right (R) and left (L) common carotid artery with airways (A: arrowheads) and cervical vertebrae (B: arrowheads). The origin of the left common carotid artery takes place in correspondence to the innominate artery origin, configuring a bovine aortic arch (A: star).

![Image](https://via.placeholder.com/150)

**Fig. 2.** (A, B) Kissing common carotid arteries. Left common carotid artery tortuosity, S-shaped (B, arrows).
pravastatin 40 mg daily were added. One year after, a new enhanced CT-scan revealed unchanged findings, without any recurrence of neurological symptoms.

**DISCUSSION**

During embryological development, carotid arteries derive from the union of the proximal aortic ventral sac, the third aortic arch and the distal portion of dorsal aorta, resulting from involution of the first two aortic arches and the ductus carotidus, the portion between the third and the fourth aortic arch [4]. Their normal course is inside the carotid sheath, lateral to the esophagus and posterolateral to the pharynx, up to the carotid bifurcation that, in most cases, occurs between the second and the fifth cervical vertebra. Carotid artery anomalies may be related to their development (agenesis, aplasia, hypoplasia) or their course (coiling, kinking, tortuosity). Carotid arteries rarely develop in uncommon anatomical spaces, extending to the retropharyngeal or prevertebral regions. Although most of these cases have no clinical relevance, some authors have supported the existence of potential dangers related to anatomical variations of carotid arteries: 1) development of hemodynamic forces favoring progression of atherosclerosis [5], 2) risk for insufficiency of catastrophic vascular injuries during surgical or anesthetic maneuvers [6], 3) symptoms arising from compression or from pressure effects on the trachea or esophagus [3] and 4) source of unexpected technical challenge in case of endovascular procedure.

To our knowledge, this is the first report of a symptomatic patient with a completely bilateral retropharyngeal course of CCAs originating from a bovine aortic arch, with a severe stenosis of the left ICA which caused an ipsilateral symptomatic brain injury. “Bovine-type” is the most common congenital anomaly of the aortic arch in humans, occurring in about 20%-25% of cases [7]. This pattern can be shown alone or in combination with other anatomical abnormalities [8].

The Carotid course of the CCA is extremely rare. Koreckij et al. [9] have shown an incidence of retropharyngeal course of 2.6% in a population of 1,000 cervical magnetic resonance angiographies (MRA). Among the patients with this anomaly, defined as one or more portions of the CCA or ICA medial to the unco-vertebral joint, women were 88% and about a third of them had bilateral anomalies. Muñoz et al. [3] reported four cases of patients with retropharyngeal carotids, bilateral in two cases and symptomatic for dysphagia and/or respiratory problems in three cases. Virvilis et al. [10] described the case of a symptomatic patient in which both CCAs had a completely retropharyngeal course, in association with hypoplasia of the right CCA and ICA but without any significant stenosis. DUS analysis in this kind of patients is inaccurate and could be dangerously misleading. Only CTA or MRA provide accurate information about vessel location, anatomic relations with adjacent structures and the coexistence of significant atherosclerotic lesions.

Although affected by severe (greater than 70%) and symptomatic carotid stenosis, this patient was not submitted to any procedure, because of the advanced age and comorbidities. We think that, in the event of significant anatomical variations, surgical indications must be very cautious, to avoid failures and/or catastrophic complications.

In conclusion, abnormal courses of carotid arteries are rare. However, it is important to report them and to examine relationships between vessels and adjacent anatomical structures. In case of need for revascularization, it is fundamental to pick over pros and cons of open or endovascular approaches by performing a deep assessment of the challenges that aberrant anatomical courses may involve.

Patients with anatomical abnormalities should be followed with close instrumental follow-up, although the value of DUS remains limited in such complex cases and CTA or MRA are often mandatory.
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