CASE REPORT

A rare case of absent left common carotid artery with bovine origin of the left external carotid artery

Sumit Goyal, Ajit Kumar Sinha

Department of Neurosurgery,
Sir Ganga Ram Hospital, New
Delhi, India

Correspondence to

Dr S Goyal, Department of
Neurosurgery, Sir Ganga Ram
Hospital, New Delhi 110060,
India;
drgoyalsumit@gmail.com

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SUMMARY

A 22-year-old man had cerebral venous sinus thrombosis and his angiogram incidentally revealed an absent left common carotid artery with bovine origin of the left external carotid artery. There was also an associated low bifurcation of the right common carotid artery and basilar artery fenestration. The absence of a common carotid artery is a very rare angiographic finding, and an association with a bovine origin of the left external carotid artery has not been reported previously in the literature. Here we provide a description of the case along with a review of the literature and embryology.

BACKGROUND

The absence of a common carotid artery is a rare vascular anomaly, with only 36 cases reported up to 2009, and even fewer angiographically.¹ It is often associated with other vascular anomalies, such as intracranial aneurysm, cervical aortic arch, double aortic arch, and persistent trigeminal artery.²⁻³ When this anomaly occurs on the left side, both the external carotid artery (ECA) and internal carotid artery (ICA) arise from the aortic arch. In the present case, the ECA had a common origin with the innominate artery, erroneously also referred to 'bovine origin',⁴ and the left ICA had a direct origin from the arch of the aorta. To our knowledge, this is the first case of an absent left common carotid artery with bovine origin of the left ECA.

CASE PRESENTATION

A 22-year-old man was admitted with a history of sudden onset severe headache for which he was evaluated. Neurologically, the patient had no deficits and his non-contrast head CT showed right parietal intraparenchymal hematoma. DSA was performed which revealed thrombosis of the right transverse sinus and superior sagittal sinus. It also revealed an interesting and rare variation in his arterial anatomy. He had low bifurcation of the right common carotid artery and there was complete absence of the left common carotid artery (figure 1A). The left ECA had a common origin with the innominate artery (also erroneously referred to as 'bovine' origin) (figure 1B, C). The left ICA originated as a separate vessel from the aortic arch and was only supplying the left middle cerebral artery circulation (figure 2A, B). The left vertebral artery angiogram revealed the presence of basilar non-union (also known as basilar fenestration) (figure 3). He was managed conservatively for sinus thrombosis from which he recovered

Figure 1 (A) DSA of the brachiocephalic trunk showing a low bifurcation of the right common carotid artery and common (bovine) origin of the left external carotid artery (ECA). (B) DSA of the brachiocephalic trunk showing bovine origin of the left ECA with complete absence of the left common carotid artery. (C) Lateral view of the left ECA which had a common origin from the innominate trunk.

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Figure 2 (A) DSA showing direct origin of the left internal carotid artery (ICA) from the arch. (B) DSA of the left ICA, which revealed the ICA supplying only the middle cerebral artery territory.

Figure 3 DSA of the left vertebral artery showing the basilar fenestration.

completely and was eventually discharged in good clinical condition.

DISCUSSION

In his extensive monograph, Lie⁵ reviewed anomalies of the carotid arteries. It was probably Malacarne⁶ who reported the first case of absent common carotid artery in 1784. Often this anatomic variation is asymptomatic and is detected on post mortem studies. However, there are even fewer angiographically proven cases of this anomaly. Supsupin⁷ first demonstrated bilateral absence of the common carotid artery on CT angiogram. There were two reported cases of this anomaly with symptomatic stenosis, and in three cases this was associated with intracranial aneurysm.⁸ In the present case, development of sinus thrombosis led to angiographic evaluation of the patient, leading to detection of this anomaly.

The origin of these anomalies can be explained in terms of the classical conception of aortic arch differentiation. In a 12–14 mm embryo, the ductus caroticus, which connects the third and fourth branchial arch dorsally, involutes and the common carotid artery is formed from the root of the ventral aorta between the third and fourth arches. The third aortic arch persists as the proximal portion of the ICA. If both the third arches persist and both

the fourth arches involute, there would be a separate origin of the ECA and ICA, with a high cervical aortic arch.

The other theory suggests obliteration of the third arch with persistence of the ductus caroticus, which would lead to separate origins of the ICA and ECA.

Another explanation for an absent or short common carotid was given by Boyd.⁹ He suggested that the ECA might take origin from the third arch vessel nearer the aortic sac, making the common carotid artery shorter, and if the origin were far enough caudal, the common carotid artery would be absent. He further emphasized that persistence of the ductus caroticus is not an invariable factor for an absent common carotid artery. This also seems to be a more plausible explanation in our case where the left common carotid artery is absent and the right common carotid artery is shorter.

Basilar non-union is a more common angiographic observation which occurs due to failure of fusion of the longitudinal neural arteries and regression of the bridging arteries that connect the longitudinal arteries, and is often associated with aneurysm formation.¹⁰ However, the presence of both anomalies in the same patient has not been described previously in the literature, and represents an alteration in embryogenesis at around the fourth to sixth week of embryonic life.

Although the presence of these angiographic findings did not had any clinical relevance in the present case, they pose a challenge during angiography, and being aware of such rare anatomical variations is helpful in easing safe access to these vessels.

CONCLUSION

Congenital absence of the common carotid artery is a rare angiographic finding which may pose a significant challenge during angiography. Associated bovine origin of the left ECA and the presence of basilar fenestration make this case even rarer.

Learning points

- ▶ The aortic arch can have many variations, which can pose an angiographic challenge.
- ▶ The key to understanding these variations lies in understanding the embryology.
- ▶ Careful evaluation of these variations is important in treatment planning.

Contributors SG performed the DSA and drafted the paper. Both authors were actively involved in patient care and management. Both authors were involved in critically analyzing the paper and approve the contents of the paper. Both authors also agree to be accountable for all the aspects of the work submitted for publication.

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