

Duplicated origin of right vertebral artery with rudimentary and accessory left vertebral arteries

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Summary. We observed a rare cerebrovascular anomaly in a patient with brain-stem infarction. Two right vertebral arteries arose from the subclavian artery and communicated directly with each other under the transverse foramen of the fourth cervical vertebra. The left vertebral artery consisted of a rudimentary artery that arose from the left subclavian artery, ran through the transverse foramen of the sixth cervical vertebra and then tapered down to disappear at the fourth/fifth cervical vertebrae, plus a second, accessory artery that arose from a branch of the left thyrocervical trunk, ran through the transverse foramen of the fifth cervical vertebra and tapered off to disappear at the first/second cervical vertebrae.

Key words: Vertebral artery, duplicate origin – Rudimentary artery – Accessory artery – Brain-stem infarction

Anomalous origins of the vertebral artery are present approximately 5% of individuals [1, 2]. The majority are direct origin of the left vertebral artery from the aortic arch between the left common carotid and subclavian arteries,

or origin from the aortic arch distal to the left subclavian artery. Anomalous duplicated origin [3–11] or dual vertebral arteries (rudimentary and accessory arteries) [1, 2, 12] are relatively rare.

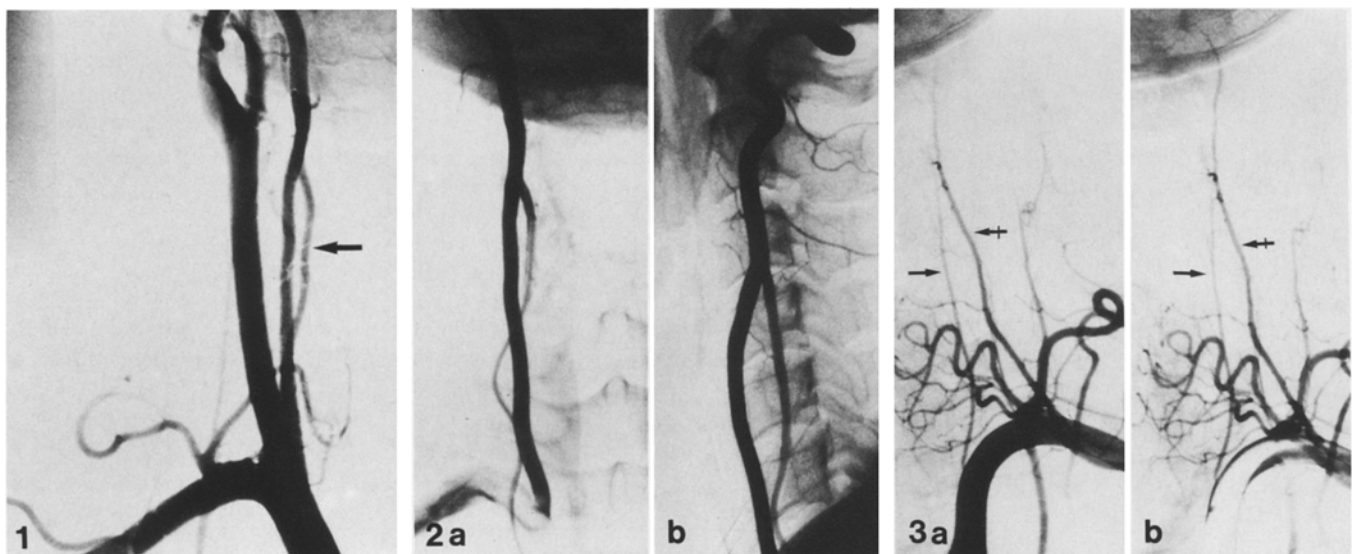
Case report

A 37-year-old man suffered sudden pain in the left eye and ear and vomiting while taking a bath. The apparent neurological deficits evolved over the next 4 h. Family history and past medical history

Fig. 1. Right retrograde brachial angiography, frontal projection. Duplicated origin of right vertebral artery. Its distal branch (*arrow*) ascends via the transverse foramen of the sixth cervical vertebra. The two vessels join on the right under the transverse foramen of the fourth cervical vertebra

Fig. 2. Selective vertebral angiography, frontal and lateral projections. Both arteries arise from the right subclavian artery

Fig. 3a,b. Left retrograde brachial angiography, frontal projection. Rudimentary (*arrow*) and accessory (*crossed arrow*) arteries arise from the proximal subclavian artery and thyrocervical trunk. They do not communicate directly with each other



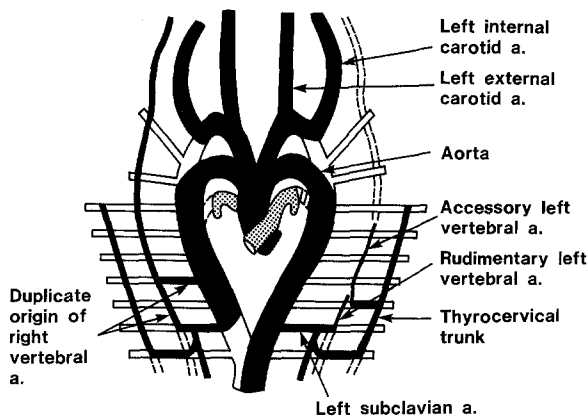


Fig. 4. Diagram of this case (after Haughton and Rosenbaum [2])

were noncontributory. He was admitted to hospital the next day, when neurological findings of lower cranial nerve palsies, cerebellar ataxia etc. were those of a left rostral pontine tegmentum syndrome. General examination was normal, as was CT of the head.

No disease causing brain-stem infarction was found in the heart, peripheral blood vessels, blood coagulation or metabolic system. Cerebrovascular anomalies were detected during four-vessel cerebral angiography (Figs. 1–3). His symptoms were diagnosed as due to ischaemic cerebrovascular disease; they gradually improved with conservative treatment, and he was discharged after 1 month.

Discussion

Anomalous duplicated origin of the vertebral artery is not extremely rare [9]. We have found 12 cases, including this one, reported as clinical cases (excluding anatomical

studies) (Table 1). The report of this anomaly as a cause of examined disease has not been found [3–11].

Other vascular anomalies have been reported in many cases (Table 1); rudimentary [1, 2] and accessory vertebral arteries [12] were observed in our case. Daseler and Anson [12] reported that in 693 anatomical specimens, an anomaly described as “dual” or “accessory” vertebral artery was present in 5 (0.72%), always on the left, arising from the aortic arch in 3 and from the thyrocervical trunk, as in the present case, in 2.

It is well known that anomalies of growth in the embryo may lead to anomalous origin of the vertebral arteries [2, 13].

The duplicated origin of the vertebral artery in this case could have arisen as follows. The fourth rudimentary branch of the first to fifth cervical intersegmental arteries, developing at the 7 mm human fetal stage (ovulation; 32 ± 1 day) and disappearing at 14–17 mm, and the sixth cervical intersegmental artery, a branch of the subclavian artery, were connected to the longitudinal anastomoses between the cervical intersegmental arteries. These become the vertebral artery, extending cephalocaudad at the 10–12 mm fetal stage [2, 13, 14]. This is shown diagrammatically in Fig. 4.

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Table 1. Clinically reported duplicated origins of the vertebral artery

Authors	Age (years)	Sex	Side	Origin	Level of fusion	Disease and/or symptoms	Accompanying vascular anomalies
Kiss (1968)	46	m	r	Brachiocephalic trunk, r subclavian artery	C5	Paraesthesia of r arm	l carotid artery arises from brachiocephalic trunk, l vertebral artery from aortic arch
Kowada et al. (1972)	19	f	l	Aortic arch (suspected), l subclavian artery	C5	Post-traumatic epilepsy	Fenestration of the distal l vertebral artery
Babin and Haller (1974)	18	f	r	Both branches originate from the r subclavian artery	C5	Epilepsy	Dolichoarterial loop of the l vertebral artery
Suzuki et al. (1978)	66	m	l	Aortic arch, l subclavian artery	C5	Dysphagia, respiratory distress	Aortic aneurysm
Rieger and Huber (1982)	43	f	l	Aortic arch, l subclavian artery	C4	Cerebrovascular insufficiency	Aneurysm of the r extracranial carotid artery; r vertebral artery enters the vertebral canal at C4
Hashimoto et al. (1986)	73	m	l	Aortic arch, l subclavian artery	C5	Dizziness, cerebellar signs	Fenestration of the distal l vertebral artery
	67	m	r	Both branches originate from the r subclavian artery	C5	Temporal and cerebellar infarction	None
Eisenberg et al. (1986)	20	m	l	Aortic arch, l subclavian artery	C5	Subarachnoid haemorrhage	None
	26	m	l	Aortic arch, l subclavian artery	C5	Neck trauma	None
Harada et al. (1987)	70	f	r	Both branches originate from the r subclavian artery	C4	Occipital heaviness, dizziness	Hypoplastic l vertebral artery
Mashiyama und Watanabe (1989)	59	f	l	Aortic arch, l subclavian artery	C4	Brain tumour	None
Takasato et al. (1992)	37	m	r	Both branches originate from the r subclavian artery	C4	Brain-stem infarction	Rudimentary and accessory l vertebral arteries

m, male; f, female; r, right; l, left

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