VIA MEDICA

CASE REPORT

Folia Morphol.
Vol. 64, No. 1, pp. 47–50

ISSN 0015–5659
www.fm.viamedica.pl

A new variant of aberrant left brachiocephalic trunk in man: case report and literature review

Michał Szpinda

Department of Normal Anatomy, the Ludwig Rydygier Collegium Medicum *in Bydgoszcz, the Nicolaus Copernicus University in Toruń, Poland*

[Received 3 September 2004; Revised 19 November 2004; Accepted 19 November 2004]

Importance is placed on aberrant arteries in the radiological and surgical literature. A normal left brachiocephalic trunk is characteristic for the right aortic arch. However, an aberrant left brachiocephalic trunk arising as the last branch of the aortic arch on the left side has not yet been described in the literature. Described here is a new variant of the retro-oesophageal aberrant left brachiocephalic trunk, occasionally observed in a patient during diagnostic investigation or surgical treatment for steno-obstructive involvement of the carotid district. The triple anomaly of the left aortic arch consisted of: 1. the presence of a hypoplastic left brachiocephalic trunk behind the oesophagus, 2. the absence of a brachiocephalic trunk on the right side and 3. separate origins of the arteries on the right side, with the right common artery preceding the right subclavian artery. In front of the trachea an 8-mm prosthetic PTFE was implanted from the proximal segment of the right subclavian artery to the junction of the left common carotid and left subclavian arteries. The author demonstrates the inadequacy of auxiliary investigations to detect aberrant arteries, which may only be identified precisely intra-operatively.

Key words: aberrant arteries, *arteria lusoria*

INTRODUCTION

Variation in the number and arrangement of the great vessels of the aortic arch is not rare and there are only a few developmental disorders which are clinically significant. In this latter group aberrant arteries are an interesting variation from a radiologist's and surgeon's point of view [1, 3–6, 8, 9, 14, 21]. An aberrant right subclavian artery, also known as the *arteria lusoria*, is the most common anomaly of the aortic arch, with a reported prevalence ranging from 0.4 to 2% [9, 10, 12, 18, 22, 24]. A normal left brachiocephalic trunk is typical for the right aortic arch. This rare variety (0.1%) results from the persistence of the right 4th branchial arch [2, 13]. The aortic arch runs in the reverse direction over the root of the right lung and the branches maintain a normal succession in relation to the body. However, their position on the aortic arch itself is a mirror-image of the typical pattern. Hitherto descriptions of the left aberrant brachiocephalic trunk have invariably emphasised its pretracheal position [7, 11, 20, 23]. The left aortic arch with a left aberrant brachiocephalic trunk, running behind the oesophagus, has never been described. Thus this case report fills a gap and broadens the definition of the types of aortic arch branching.

CASE REPORT

A patient (M.A.), aged 49, was admitted to the Clinic of General and Vascular Surgery for complete diagnosis and possible treatment of aortic arch syndrome. For many years the patient had complained of headaches and vertigo, syncope and muscular weakness in the left upper limb. The patient had undergone a left anterior scalenotomy in this clinic

Address for correspondence: Michał Szpinda, MD, Department of Normal Anatomy of Ludwik Rydygier *Collegium Medicum*, ul. Karłowicza 24, 85–092 Bydgoszcz, Poland, tel: +48 52 585 37 05, fax: +48 52 585 37 53, e-mail: kizanat@cm.umk.pl

10 years earlier. Objective examination revealed lack of a pulse in the left radial artery with immeasurable blood pressure in the brachial artery simultaneous with blood pressure in the right brachial artery of 100/70 mm Hg. Doppler investigation revealed significant haemodynamic disturbances in the distal part of the left subclavian artery, with the curve showing only diastolic waves of the broadened spectrum and no systolic waves. In the narrow left common carotid artery the flow curve was almost flat, with a wide spectrum. Doppler pressure in the right and left arms was 110 mm Hg and 70 mm Hg, respectively. In the arteriographic picture (Fig. 1) a 10-cm-long occlusion of the proximal segments of the common carotid and subclavian arteries was observed on the left side, while their further segments were filled by collateral circulation. The right common carotid artery arose as the 1st branch and the right subclavian artery as the 2nd branch of the aortic arch (Fig. 2). The patient was qualified to reconstructive vascular surgery with chest opening by midline sternotomy. A triple anomaly of the left aortic arch was observed intra-operatively (Fig. 3). This consisted of: 1. the presence of a hypoplastic left brachiocephalic trunk running behind the oesophagus, 2. the absence of a brachiocephalic trunk on the right side and 3. separate origins of the arteries on the right side, where the right common artery preceded the right subclavian artery.

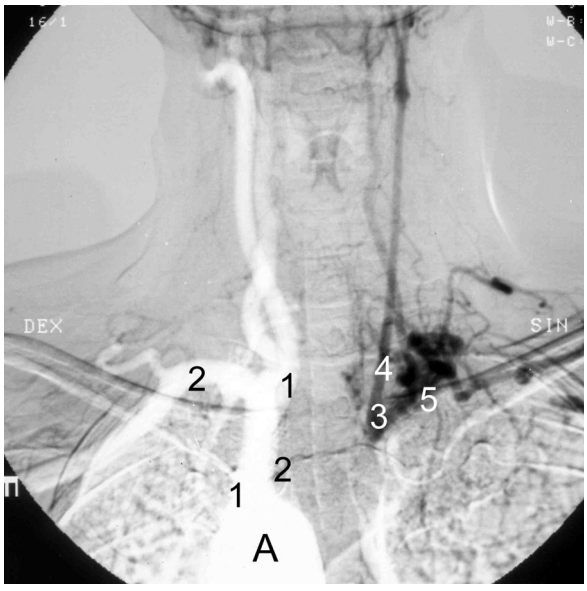

Figure 1. AP arch aortogram showing a 10-cm-long occlusion of the proximal segments of the left arteries of the aortic arch; their further segments fill from collateral circulation: A — left aortic arch, 1 — right common carotid artery, 2 — right subclavian artery, 3 — junction of the left common carotid and left subclavian arteries, 4 — left common carotid artery, 5 — left subclavian artery.

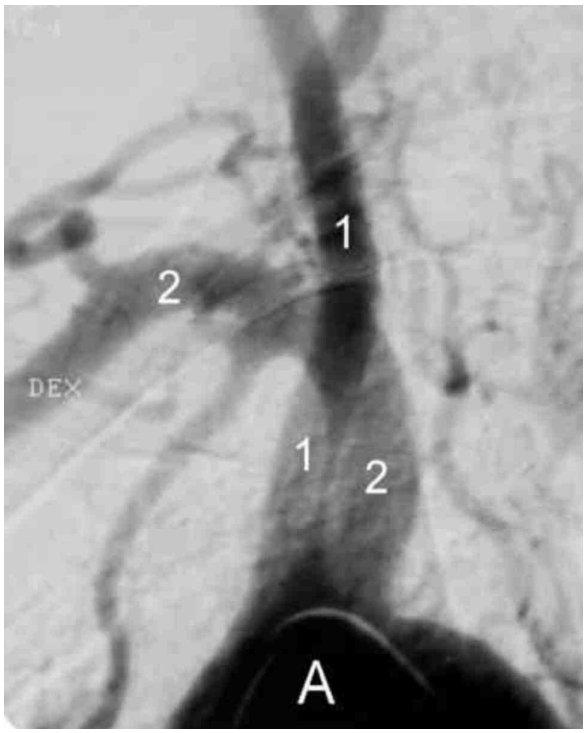

Figure 2. Left anterior oblique arch aortogram illustrating the separate origin of the right common carotid and subclavian arteries: 1 — right common carotid artery, 2 — right subclavian artery.

In front of the trachea an 8-mm prosthetic PTFE was implanted from the proximal segment of the right subclavian artery to the junction of the left common carotid and left subclavian arteries. In the postoperative course no complications were observed and the patient was discharged from hospital 6 days after the operation in very good general condition and free from the previous complaints. The left radial artery was palpable and blood pressure was identical in both brachial arteries (100/70 mm Hg).

DISCUSSION

Aberrant arteries of the aortic arch are a result of irregular development of the 4th pair of branchial arches. The right aberrant subclavian artery, the *arteria lusoria*, arises on the left side of the midline as the last branch of the left aortic arch and crosses the mediastinum obliquely from left to right, indenting the oesophagus posteriorly. This pattern corresponds to type G of the Adachi-Wiliams-Nakagawa-Takemura classification of aortic arch branching [1]. Its mirror-image as the left aberrant subclavian artery, originating on the right side as the last branch of the right aortic arch [7, 11, 20, 23], was reported by Adachi as a type M anomaly [1].

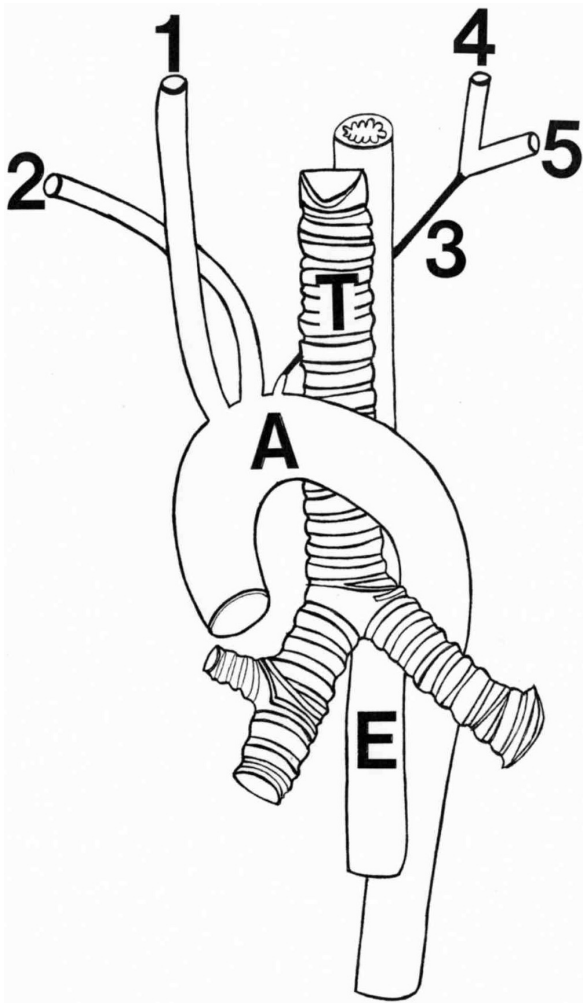

Figure 3. Diagram illustrating the arterial anomaly of the aortic arch visualised intra-operatively: A — aortic arch, T — trachea, E — oesophagus, 1 — right common carotid artery, 2 — right subclavian artery, 3 — left brachiocephalic trunk, 4 — left common carotid artery, 5 — left subclavian artery.

Aberrant arteries of the aortic arch give rise to the conditions known as *dysphagia lusoria* and *dyspnoea lusoria* [9, 10, 15, 18, 19]. These anomalies should be suspected early in children with undetermined respiratory symptoms and can easily be confirmed by CT scan, arteriography, oesophagoradiogram and tracheoscopy [15]. Roberts et al. [19] observed a right aortic arch with an aberrant left subclavian artery in half of a group of 30 children who underwent surgery for tracheo-oesophageal compression caused by aortic arch anomalies. In the remainder he observed either a double aortic arch (10 cases) or a left aortic arch with aberrant vessels, a right subclavian artery (4 cases) and a right brachiocephalic trunk (1 case). Anson [2] described a bi-innominate sequence in 1.2% of individuals in whom the normal left and right brachiocephalic trunks arose from the left aortic arch. Brachiocephalic trunks are generally situated in the anterior superior mediastinum. The literature describes only casuistic cases of these trunks passing through the posterior mediastinum. Roberts et al. [19] observed a left aortic arch with a retro-oesophageal aberrant right brachiocephalic trunk. Then Moes et al. [16, 17] described a left aberrant brachiocephalic trunk with mirror-image branching. Neither the hypoplasia of the left brachiocephalic trunk nor its aberrant course in the posterior mediastinum as observed in this case report is reflected in the literature. Kurata et al. [11] presented a case only outwardly similar to the anomalies observed by the author of this case report. This considered a 44-year-old man with muscular weakness in his left upper extremity, vertigo and diplopia. Intra-operatively a sequence of branching of the aortic arch was visualised, identical to that in the present case, from the right to the left side and consisting of a right common carotid artery, a right subclavian artery and a hypoplastic left brachiocephalic trunk. This similarity is ended by Kurata's observation [11] of a right aortic arch, while in the present report a left aortic arch was observed. These two cases had, however, an identical atypical origin of the right subclavian artery between the right common carotid artery and the hypoplastic left brachiocephalic trunk. The manner of reconstruction of these vascular malformations using an 8 mm PTFE graft was also similar, with the difference that Kurata et al. [11] made a proximal anastomosis to the ascending aorta, while in the author's case it was to the atypical right subclavian artery. Both Kurata et al. [11] and the author of the present case report reveal imperfections in the detection of vascular malformations, the exact identification of which is possible only intra-operatively or through anatomical dissection. Knowledge of the aberrant vessels, therefore, helps significantly in the interpretation of radiological vascular studies.

REFERENCES

1. Adachi B (1928) Das Arteriensystem der Japaner. Vol. I. Kyoto: Maruzen, pp. 29–30.
2. Anson BJ (1963) The aortic arch and its branches. Luisada A. Cardiology. Vol. I. New York: Mc Graw-Hill, pp. 119–126.
3. Ballota E, Bardini R, Bottio T (1996) Aberrant right subclavian artery. An original median cervical approach. Surg Torino J Cardiovasc, 6: 571–573.
4. Baudet E, Rogues XF, Guibaud JP (1992) Isolation of the right subclavian artery. Ann Thorac Surg, 3: 501–503.

5. Bertolini A, Pelizza A, Panizzon G (1987) Vascular rings and slings. Diagnosis and surgical treatment of 49 patients. J Cardiovasc Surg Torino, 3: 301–312.
6. Czerwinski F, Mierzwa A, Krzanowski K (1993) Rare cases of arteries branching directly from the aortic arch in man. Folia Morphol, 4: 223–231.
7. Inoue K, Terashima T, Inoue Y, Suenaga Y (1984) A case report of the incomplete double aortic arch. Hokkaido Igaku Zasshi, 2: 176–179.
8. Kalke BR, Magotra R, Doshi SM (1987) A new surgical approach to the management of symptomatic aberrant right subclavian artery. Ann Thorac Surg, 1: 86–89.
9. Kollar J, Arany L (1987) Arteria lusoria. Rontgenblatter, 2: 50–54.
10. Komiyama M, Matsuno Y, Shimada Y (1995) Variation of the right subclavian artery as the last branch of the aortic arch in two Japanese cadavers. Okajimas Folia Anat Jpn, 5: 245–247.
11. Kurata H, Satoh S, Kohno M, Kajiwara H, Mashimo Y, Satoh H (1989) Brachiocephalic arterial aplasia of the right aortic arch with subclavian steal syndrome. Nippon Kyobu Geka Gakkai Zasshi, 1: 171–174.
12. Kurt MA, An I, Ikiz I (1997) A case with coincidence of aberrant right subclavian artery and common origin of the carotid arteries. Anat Anz, 2: 175–176.
13. Langman J (1975) Medical Embryology. Baltimore: Williams and Wilkins Co, pp. 84–96.
14. Lee R, Maughan RE, Svensson LG (1997) Elephant trunk reconstruction for aberrant right subclavian and aortic aneurysm. Ann Thorac Surg, 2: 547–548.
15. Maksoud-Filho JG, Goncalves ME, Tannuri U (1993) Compression of esophagus and trachea by aortic arch anomalies in childhood. Rev Assoc Med Bras, 3: 165–169.
16. Moes CA, Freedom RM (1993) Rare types of aortic arch anomalies. Pediatr Cardiol, 2: 93–101.
17. Moes CA, MacDonald C, Mawson JB (1995) Left innominate vein compression by a brachiocephalic artery anomaly. Pediatr Cardiol, 6: 291–293.
18. Nakatani T, Tanaka S, Mizukami S (1996) Retroesophageal right subclavian artery originating from the aortic arch distal and dorsal to the left subclavian artery. Anat Anz, 3: 269–271.
19. Roberts CS, Othersen HB Jr, Sade RM, Smith CD 3rd, Tagge EP, Crawford FA Jr (1994) Tracheoesophageal compression from aortic arch anomalies: analysis of 30 operatively treated children. J Pediatr Surg, 2: 334–338.
20. Savastano S, Feltrin P, Chiesura-Corona M, Mioffa D (1992) Cerebral ischemia due to congenital malformations of brachiocephalic arteries — case reports. Angiology, 1: 76–83.
21. Segesser L, Faiduffi B (1984) Symptomatic aberrant retro-esophageal subclavian artery: considerations about the surgical approach, management and results. Thorac Cardiovasc Surg, 32: 307–310.
22. Seres-Sturm M, Maros TN, Seres-Sturm L (1985) The aberrant retroesophageal right subclavian artery. Morphol Embryol Bucur, 3: 183–186.
23. Tanaka H, Yamaki K, Saga T (1997) A rare case of the right-sided aortic arch that has the right subclavian artery as the last branch. Kurume Med J, 2: 147–152.
24. Turkenburg JL, Versteegh MI, Shaw PC (1994) Case report: aneurysm of an aberrant right subclavian artery diagnosed with MR imaging. Clin Radiol, 11: 837–839.