

Retroesophageal right subclavian artery: a case report and a review of literature

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SUMMARY

We report a case of a rare anatomical anomaly of the retroesophageal right subclavian artery (RRSA) post-mortem. The subclavian arteries may vary in their origin, course or length. The right retroesophageal subclavian artery is a frequent defect of the embryological aortic arches. This variation is due to interruption of the fourth right aortic arch between the notches for the common carotid artery and the subclavian artery while the left fourth arch remains intact. A regression of proximal portion of the right subclavian artery occurs and the retroesophageal aortic arch persists.

Key words: Aberrant subclavian artery – Dysphagia lusoria – Anatomic variations – Aortic arch – Retroesophageal subclavian artery

INTRODUCTION

The right retroesophageal subclavian artery is a rare anomaly. In several large necropsy series, the incidence of an aberrant right subclavian artery varies from 0.2 to 2.5% (Nakatani et al., 1998). This is the most common anomaly of the aortic arch representing

17% of all such malformations. This abnormality is generally silent and is often an incidental necropsy finding. Other developmental anomalies of the embryonic aortic arch complex may involve the aortic arch itself, as well as the carotid and pulmonary arterial system.

CASE REPORT

We report the case of a 54-year old Caucasian male formalin-fixed cadaver with a right retroesophageal subclavian artery. The man died of natural causes. The following observation was noted in the dissecting room of the Department of Anatomy, School of Medicine, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil. During routine dissection of the superior mediastinum, a mass was noted. Further dissection revealed that this mass was a right retroesophageal subclavian artery. The right recurrent laryngeal nerve did not 'recur' around this anomalous vessel. Both the left and right vertebral arteries originated from the subclavian arteries in a normal fashion and both entered the transverse and left subclavian veins. No other aortic arch anomalies were noted. Gross cardiac dimensions were within normal limits.

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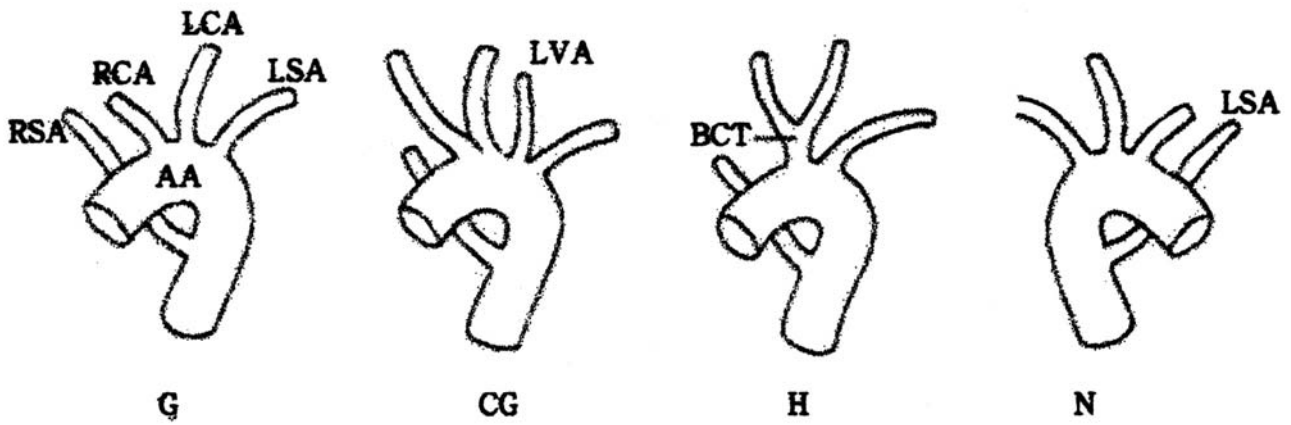


Fig. 1. The main morphologic types of the retroesophageal subclavian artery.

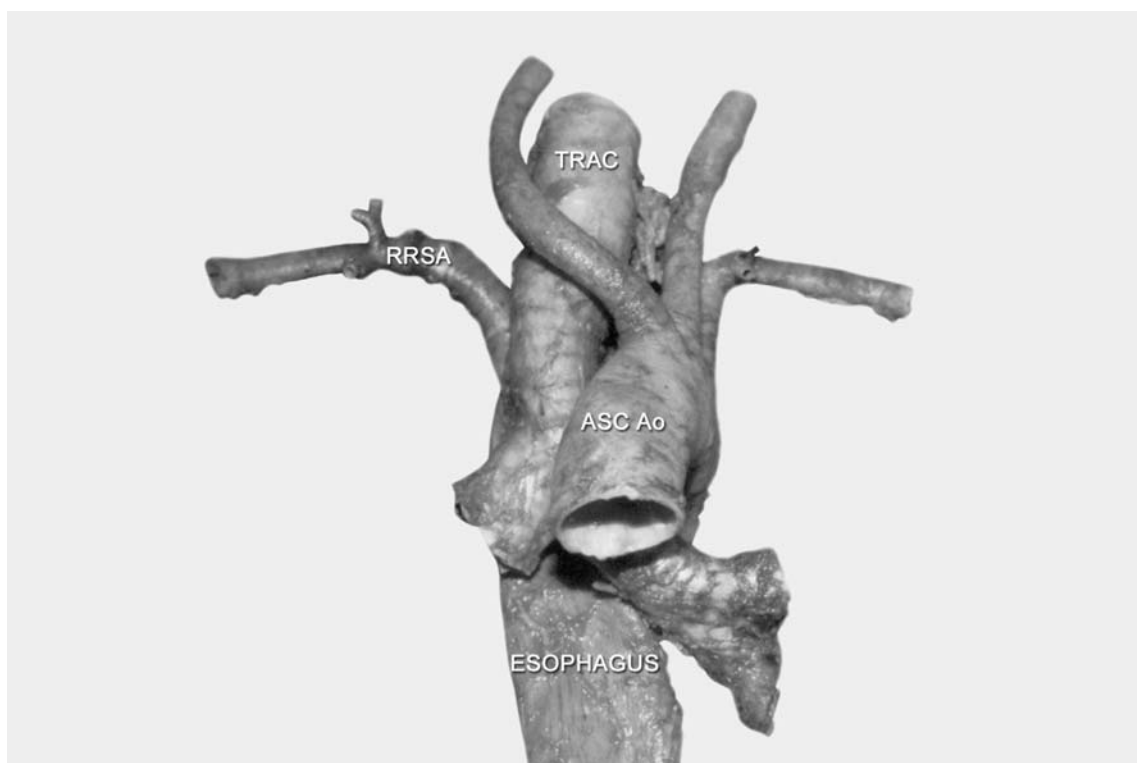


Fig. 2. Anatomical finding separated from cadaver. RRSA= Retroesophageal right subclavian artery; TRAC= Trachea; ASC Ao= Ascending aorta.

DISCUSSION

Many excellent reports can be found in the literature regarding the right retroesophageal subclavian (Tubbs et al., 2004). The first description was made in 1735 by Hanauld (cited by Williams et al., 1932). In 1794, Bayford described the symptoms produced by an aberrant right subclavian artery (cited by Carrizo and Marjani, 2004). Dysphagia lusoria, a difficulty in swallowing due to the position of the artery, compressing the esophagus, is the

most common symptom produced by an aberrant right retroesophageal subclavian artery.

In 1946, Gross first reported surgical relief of this condition in a 4-month old infant, by dividing the vessel through a left thoracotomy but it was not until 1963 that Lichter treated this anomaly in an adult patient (quoted by Berenzweig et al., 1980 and Carrizo and marjani, 2004).

Many authors estimated their findings regarding the presence of an aberrant right retroesophageal subclavian artery as 0.4% in

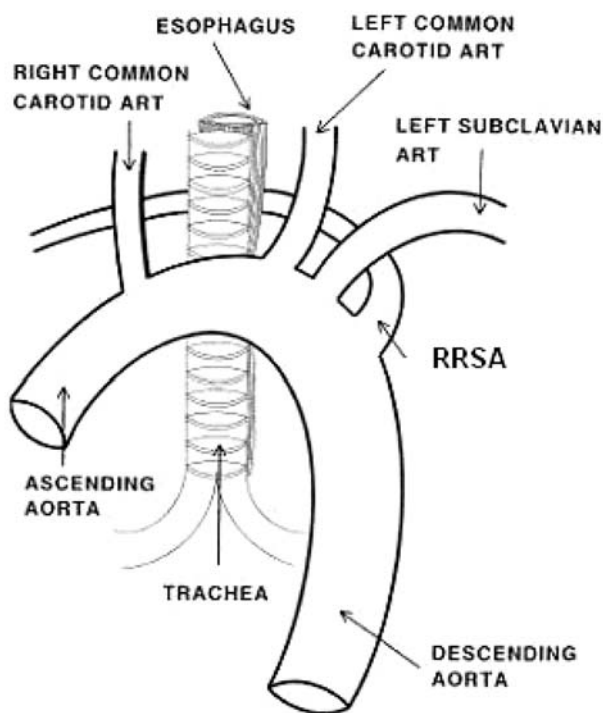


Fig. 3. Schematic drawing of the aberrant right subclavian artery. This artery has its root distal to the left subclavian artery and crosses the spinal column behind the esophagus. RRSA= Retroesophageal right subclavian artery.

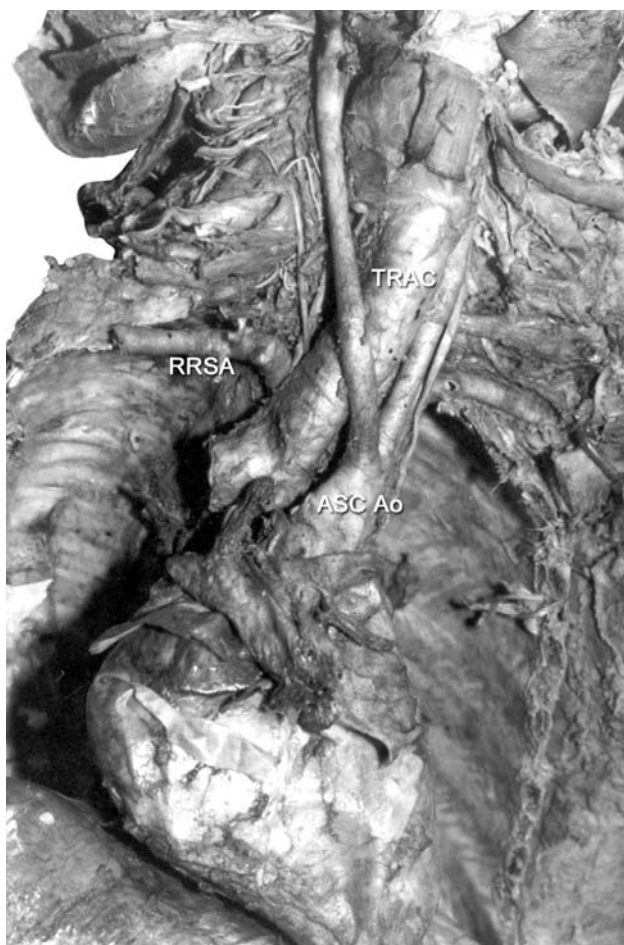


Fig. 4. Anatomical finding before complete dissection. RRSA= Retroesophageal right subclavian artery; TRAC= Trachea; ASC Ao= Ascending aorta.

dissection rooms and 1.6% during autopsies. Some of these cases have a much higher frequency in congenital heart disease (4.4%), and particular in Fallot's tetralogy (12%).

Embryologically, the aortic arches are paired arteries that appear during the fourth week of development and serve to connect the aortic sac (located ventral to the pharynx). Usually, six pairs of aortic arches form and, during the 6th-8th weeks, they become transformed into some of the major vessels of the head, neck and thorax (Moore and Persaud, 1998).

The right subclavian artery develops from three sources: (i) the right fourth aortic arch (forming the proximal part of the artery); (ii) the part of the right dorsal aorta between the right fourth aortic arch and right seventh intersegmental artery; and (iii) the right seventh intersegmental artery (Moore and Persaud, 1998). In the case of a retroesophageal right subclavian artery, the right fourth aortic arch and/or the right dorsal aorta between this arch and the right seventh intersegmental artery disappear (Tubbs et al., 2004). As a result, the proximal part of the retroesophageal artery is formed by the (abnormally persisting) caudal-most part of the right dorsal aorta, whereas the distal part is formed by the right seventh intersegmental artery, (Tubbs et al., 2004). As the arch of the aorta forms, differential growth shifts the origins of the retroesophageal right subclavian artery and the left subclavian artery in the cranial direction (Moore and Persaud, 1998). The fact that the stem of the anomalous right subclavian is derived from part of the right dorsal aorta explains the retroesophageal course that this artery follows as it passes to the upper limb.

Classification of the retroesophageal right subclavian artery is currently made according to the Adachi report about the branching pattern of the aorta (Saito et al., 2005). There are many morphologic types in the retroesophageal subclavian artery. According to the Adachi-Williams classification (Fig. 1), the anomalous branching pattern of the subclavian artery may take any of the following four basic morphologic forms:

1) *Type G*. The right subclavian artery arises from the distal pattern of the aortic arch as its last branch (Figs. 2, 3 and 4). The other stems (the right and left common carotids and the left subclavian artery) follow the ordinary arrangements. Our present case belongs to this category.

2) *Type CG*. The right subclavian artery is anomalous (as type G), and the left vertebral artery arises directly from the aortic arch.

3) *Type H*. The right subclavian artery is anomalous (as type G), and the right and left common carotid arteries have a common stem called the bicarotid trunk. However, there are still other very rare morphologic types reported by Holzapfel (1899), Poynter (1916), Edwards (1948), and Nizankowski et al. (1975).

4) *Type N*. This is the mirror image of type G. In this type, a right aortic arch is present and the origin of the left retroesophageal subclavian artery succeeds those of the two carotids and the right subclavian artery. The incidence of this type is much rarer than that of the retroesophageal right subclavian artery.

The aberrant artery may be the cause of compression of the esophagus and trachea, producing dysphagia and respiratory difficulties. This is generally more frequent in children. The appearance or recurrence of symptoms in adults may be a result of rigid atherosclerotic vessels that may compress the esophagus (Epstein and Debord, 2002). Among other symptoms sometimes produced by an anomalous RRSA, the following may be found: asymmetric pulses in the upper limb, trophic changes in the corresponding limb, erosion of the thoracic vertebrae, tracheoesophageal compression, cyanosis, arterial insufficiency and many other vascular anomalies.

Finally, the retroesophageal subclavian artery is important to angiographers, who use the right axillary, brachial or radial approaches to the ascending thoracic aorta. The presence of the anomaly is suspected in cases in which catheterization of the ascending aorta proves difficult.

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