Variants of the left aortic arch branches

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Abstract

The normal aorta has three branches from its arch, but variations in this pattern are not uncommon. Our interest was to correlate the documented statistics to the variants observed in our patients. This was done by randomly selecting 60 patients on whom arch aortograms were performed.

Our patients did not demonstrate all of the variants described. There was close correlation between the documented values and our patients except for the aberrant right subclavian artery which was more than three times more common in our patients.

Introduction

Our study was limited to variants of the left aortic arch branches as none of the patients demonstrated a right-sided arch.

Numerous variations of the aortic arch branches have been described in different texts.

For the purposes of this study we shall make use of the classification as described in the *Atlas of Neuroradiologic Embryology, Anatomy and Variants*[1] that describes seven variant types from A to G below (Figs 1-7).

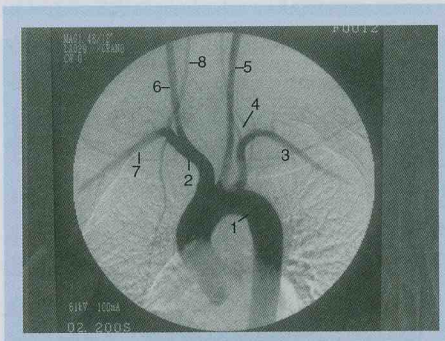

Fig. 1. Type A.

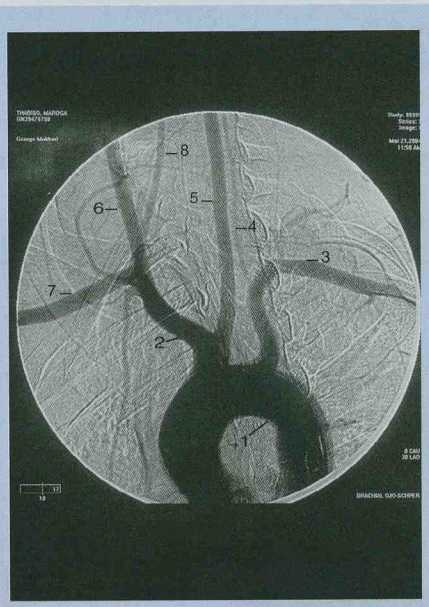

Fig. 2. Type B.

Key for Figs 1 - 7.
1. Aortic arch
2. Innominate artery (brachiocephalic trunk)

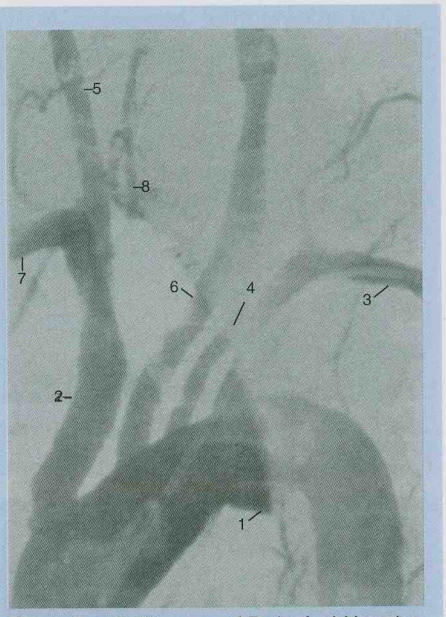

Fig. 3. Type C (Courtesy of Rutherford. Vascular Surgery. *4th ed. Philadelphia: Saunders, 1995*[1]*)*

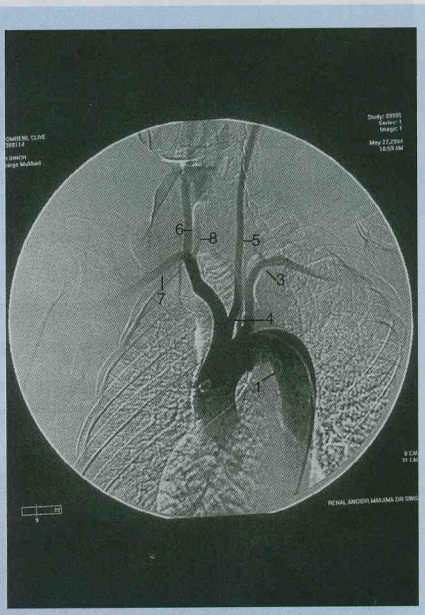

Fig. 4. Type D.

3. Left subclavian artery
4. Left vertebral artery
5. Left common carotid artery
6. Right common carotid artery
7. Right subclavian artery
8. Right vertebral artery
9. Right internal carotid artery
10. Right external carotid artery.[1]

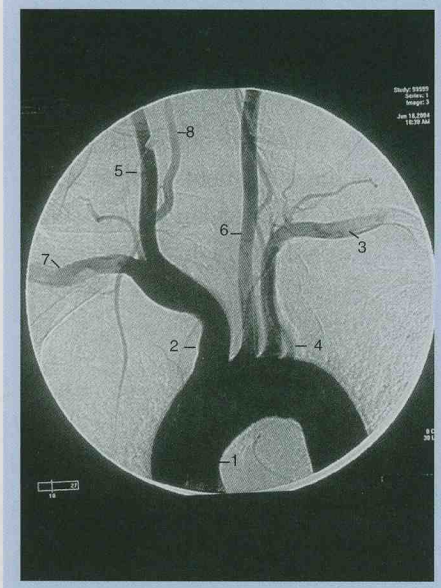

Fig. 5. Type E.

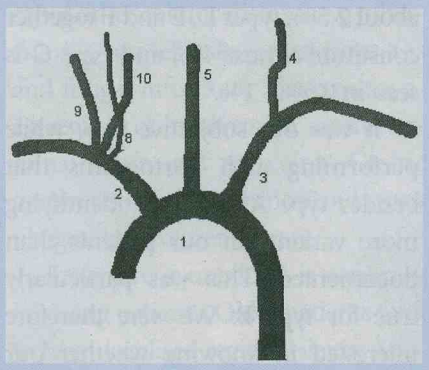

Fig. 6. Type F.

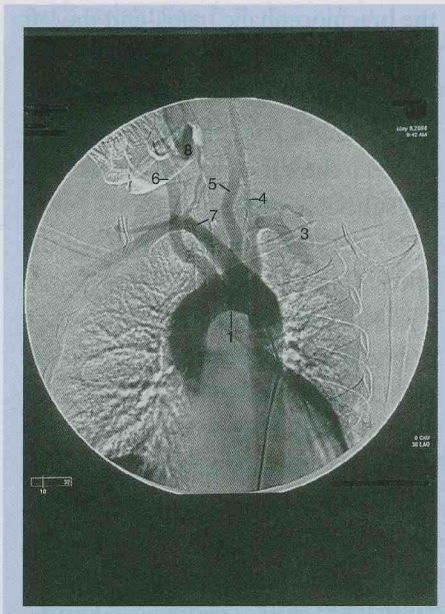

Fig. 7. Type G.

Case material

An arch aortogram was performed on all patients booked for angiographic studies. The patients were selected randomly irrespective of age. Sixty cases were accumulated between February and June 2004.

Method

We made use of our newly installed digital subtraction angiogram machine (Shimadzu Angiography Digital System, Kyoto, Japan) for imaging. All patients were examined in the supine position. Arterial catheterisation was achieved using the Seldinger's method. A 5F 'pigtail' catheter was placed in the ascending aorta, proximal to the origin of the right innominate artery. Forty millilitres of contrast (Jopamiron 300 mg) was injected using a power injector at a rate of 20 ml/second for 2 seconds. The X-ray tube was angulated in the left anterior oblique position. The results are given in Table I below.

Discussion

The normal development of the aortic arch and great vessels requires the formation and selective regression of six paired vascular arches. These arches connect the ventral aorta to paired dorsal aortas. The aortic arch develops from the persistence of the fourth left arch. [2]

In type A, the aorta commonly has three major branches originating from the superior surface of the arch. Starting from the right side, these are the brachiocephalic trunk (innominate artery), left common carotid artery and left subclavian artery (Fig. 1).

Type B has a common origin of

Table I. Association between documented and calculated values

Type of variant	Total number of patients (60)	Calculated values (%)	Documented values (%)
A	39	65.0	65.0
B	17	28.3	27.0
C	0	0.0	2.5
D	1	1.7	
E	1	1.7	≤ 4
F	0	0.0	
G	2	3.3	0.5 - 1.0

the brachiocephalic trunk and the left common carotid artery (Fig. 2).

Type C has the left vertebral artery originating separately from the arch between the left common carotid and left subclavian arteries (Fig. 3).

Type D is a combination of types B and C (Fig. 4).

Type E has the left vertebral artery originating independently from the arch distal to the origin of the left subclavian artery (Fig. 5).

Type F has low bifurcation of the right internal and external carotids, which may have separate origins from the brachiocephalic trunk (Fig. 6).

Type G has an aberrant right subclavian artery arising as a last branch distal to the origin of the left subclavian artery (Fig. 7).

Type A is documented as occurring in about 65% of the population. Type B is seen in about 27%, type C in about 2.5%, types D, E and F together constitute almost 4%, and type G is seen in 0.5% - 1%.[3]

It was our subjective view while performing arch aortograms that besides type A, we were identifying more variants in our patients than documented. This was particularly true for type B. We were therefore interested in knowing whether our presumption was statistically correct.

Conclusion

There was good correlation between the documented and calculated values seen in type A. We demonstrated 1.3% more type B than documented. No patients examined showed types C and F. Types D and E were also within documented limits. Two of the 60 patients displayed an aberrant left subclavian artery, which was a surprisingly high percentage.

References

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4. Rutherford B. *Vascular Surgery.* 4th ed. Vol. II. Philadelphia: Saunders, 1995: 1481-1482.