

## The aortic arch branching pattern: a 14,632 cases review

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Variations of the aortic arch branching pattern have a direct repercussion and influence not only in vascular surgery, but also in otorhinolaryngological and endocrinological surgery of the neck, radiological interpretation and procedures, intensive care unit patients management, mostly those with long-term nasogastric tubes, ischemic brain injuries linked to vascular interventions and during trauma patients diagnosis and management. Most of these variations are asymptomatic and have been largely considered clinically benign. Recent studies have pointed some of these vascular patterns as potential anatomical markers for thoracic aortic disease. The main objective of this work is to determine the prevalence of the aortic branching pattern reviewing a high number of cases, 14,632 (the highest as far as we know) from 38 anatomical and radiological studies, seven cohort studies and one case-control study. The second objective is to propose a novel classification which includes most of the aortic arch patterns described until now in literature, and that easily allows to add new patterns that might be described in the future. This classification was used to group the results, based primarily in the number of main arterial branches arising directly from the aortic arch, and subsequently sub-classified according to the arise of secondary arteries from the arch. Pattern IIIA of the proposed classification represents the normal anatomical disposition, and along with its subtypes, determined by secondary arteries arising directly from the arch, they represented 81.87% of the reviewed cases. Pattern II A, commonly known as “bovine arch”, when grouped with its five subtypes, represented 10.87% of the total, becoming the second anatomical variation most frequently found. Frequency of pattern II B and its subtypes was 5.40% in our review. Among secondary arteries arising frequency, 589 cases or 4.03% had a left vertebral artery emerging directly from the arch. The hardest part was to merge the results from the different studies due to the inhomogeneity of their descriptions. We believe that one of the most remarkable aspects of this work is the new classification we have created to describe the results. Since it is based on the anatomical pattern rather than frequency, it easily allows to add new patterns.

### Keywords

Aortic arch; branching pattern; classification.