

Title: Arterial distribution of the human aorta: An examination of the evolutionary, developmental, and physiological bases of asymmetry.

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The study of anatomy contends that “form follows function”; a disciplinary theme purporting that anatomical structures (i.e., cells, tissues, and organs) have a shape that serves its proper function. With this in mind, it is unclear why human arterial distribution off the aortic arch is asymmetrical, while the corresponding venous anatomy is symmetrical. We investigated the evolutionary, developmental, and physiological bases for the asymmetry of aortic arch branches in humans. First, we investigated the cardiovascular anatomy of ancestral species to determine if, and at what level, anatomical divergence (from aortic symmetry to asymmetry) occurs. Second, we examined the formation of the aortic arch and its branches during fetal development in order to determine if the asymmetry has an ontogenetic justification. Third, we considered the clinical implications associated with abnormal cases of aortic symmetry in humans. Based on our preliminary research, we hypothesize that while aortic arch asymmetry is likely beholden to several factors, the primary reason may likely be most attributable to the presence of other anatomical structures also located in the mediastinum (e.g., esophagus). That is, the aortic arch asymmetry has no self-serving functional purpose but is important in the proper functioning of neighboring anatomical structures.