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EDITORIAL

Aortic disorders: the ever-evolving surgical landscape

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History of aortic diseases is as old as that of the mankind. From the evolutionary point, in the Cambrian period, almost 600 million years ago, oxygen-producing cyanobacteria evolved, thereby enriching the then existing avid atmosphere with oxygen. Thereafter, sequential mutations allowed aerobic forms of life to dominate. Obviously, "an elastic tissue was essential in developing lungs and cardiovascular system to capture and carry oxygen to the most remote cells of beings with increasing complexity" [1]. Thus, evolved the "elastin" gene and a newer form of collagen called "elastin." However, as period lapsed, further mutations developed, which were "related to a mechanism to empower each individual species for reproductive success and not to prolong life" [1], thus leading to a wide panoply of aortic disorders ranging from aneurysms, dissections, atherosclerosis, infective/inflammatory disorders, and genetic disorders like Marfans, Loyes-Dietz syndrome, and congenital disorders like aortopathy of bicuspid aortic valve and coarctation of aorta. In fact, "hieroglyphic texts from ancient Egypt attest to the presence of aortic aneurysms, millennia before the birth of Christ" [2].

However, though the problem was overt, the treatment was recalcitrant and remained elusive until the last century. The recognition of aortic diseases occasioned just a "passionate plea, which simply stated, do not abandon them" [2]. Efforts to promote thrombosis in the sac, or to wrap the aneurysm from outside, obviously did not lead to the desired results. However, it is these initial and beyond ideas and notions of the surgeons of antiquity, considered outlandish then, that we owe the development of modern thoughts in the field. The first intuitive and technically correct repair was performed by Rudolph Matas in 1888. Thereafter, sequentially, stalwarts like Michael DeBakey, Denton Cooley, Henry Bahnson, Charles Dubost, and Frank Spencer contributed immensely to the field. It is these giant shoulders that subsequent clinicians and scientists rode on, to launch the major advances in the field in the latter half of the last century. Needless to mention, concurrent developments in the arena of imaging, cardiopulmonary bypass (CPB) and hypothermia contributed immensely to these advances.

Introduction of hypothermic total circulatory arrest by Griepp paved the way for the development of safe aortic arch replacement procedures [3]. Further advances in cerebral protection with retrograde and antegrade cerebral perfusion techniques contributed incrementally. Thereafter, sequentially evolved the trifurcated graft technique [4] and a staged elephant trunk technique with the second stage destined for either a traditional open completion, or for hybrid endovascular completion. Then came the final frontier, the evolution of endovascular strategies to handle virtually the entire aorta, either by the pure endovascular approach or hybrid methods of combining them with open surgery. The introduction of the debranching of aortic arch provided great versatility and flexibility to the endovascular solutions. Technology development in terms of creation of high quality and customized special arch-debranching grafts, especially the ones with extra side arm for deployment of antegrade stent graft in single-stage hybrid repair have given great impetus to more widespread adoption of these niche techniques [5, 6]. And the latest among the fast evolving and standardizing hybrid approaches is the frozen elephant trunk or a hybrid composite of a proximal Dacron graft and a distal stent graft for handling complex arch pathologies.

Surgeon today thus is spoiled for choices for handling aortic disorders and treatment can be customized based on the local expertise available, the logistics, economics, and the patient's risk profile. As we move forward, the techniques and technologies become more freely available and start percolating widely; I anticipate hybrid repairs and endovascular solutions to dominate the future treatment landscape of aortic disorders. It is thus extremely important that we, as surgeons, learn wire skills and develop hand-eye coordination. Thus, these will have to be built and incorporated into the curriculum of cardiac surgical trainees. To augment this training, more

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skills and simulation laboratories will need to be established. Another major step required is for the aortic surgery to be acknowledged as a standalone subspeciality, meant not for the generalists, but for surgeons with special interest in the field. In India, especially with our ever-aging population and increasing life span and our special genetic predilection for atherosclerosis, the need for aortic surgeries is bound to increase in future and just as we are losing numbers and volumes in coronaries and valves, we can compensate them with new avenues and vistas in aortic disorders.

The future may also see interventions in terms of molecular and genetic solutions to aortic disorders. Already FBN-1 Gene for Marfans, TGFBR1, and 2 genes for Loyes-Dietz syndrome and SNAD3 causing aneurysm—osteoarthritis familial disease and deficiency of Fibrillin 1 in aortopathy associated with bicuspid aortic valve are potential targets for these disrupting themes.

This featured issue on aortic disorders, diligently guest edited by Prof. Nicholas T Kouchoukos and Dr. Mohamad Bashir, touches on all of these issues, and many more, in an effort to bring to you a bird's eye view of the rapidly evolving landscape of aortic disorders.

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