



Advances in pediatric cardiology

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Almost four hundred years have passed since the renowned English physician and anatomist William Harvey fundamentally changed our understanding of the cardiovascular system, with his revolutionary work on the circulation of blood, as detailed in his publication "*De Motu Cordis*" [1, 2]. His insights into the systemic circulation of blood and the heart's role as a pump provided the cornerstone upon which the study of cardiac physiology and, eventually, pediatric cardiology, would be built.

In the 20th century, the field of pediatric cardiology witnessed a transformative period due to the remarkable contributions of visionary pioneers. Dr. Maude Abbott, Canadian physician and pathologist, meticulously researched and classified the most common congenital heart malformations – later collected in the "*Atlas of congenital heart disease*" – invaluable guiding future generations of cardiologists and

cardiac surgeons [3]. Meanwhile, Einthoven developed the first electrocardiography system, an innovation that was later awarded a Nobel Prize [2]. Some decades after, Dr. Robert Gross performed the first heart surgery in pediatrics with the first closure of a patent ductus arteriosus [4]. While this was going on, Dr. Helen Taussig observed that *blue babies*, affected by cyanotic heart defects such as Tetralogy or Fallot, and a patent ductus arteriosus had less severe symptoms and higher likelihood of survival. Her collaboration with Dr. Alfred Blalock and surgical technician Vivien Thomas resulted in the development of an artificial ductus, the Blalock-Thomas-Taussig shunt, able to bring blood to the lung when the pulmonary artery was compromised [5, 6]. This surgical procedure revolutionized the treatment of cyanotic congenital heart diseases. Overall, Dr. Taussig's studies on cardiac physiology in congenital cardiac diseases – collected in "*The congenital malformation of the heart*", 1947 – and her unwavering dedication to improving the lives of children with heart conditions left an indelible mark on the field and continues to inspire pediatric cardiologists worldwide [5, 6]. Finally, in addition to his seminal contributions to the perinatal pulmonary vascular physiology and the pharmacological closure of the ductus arteriosus [7], we recognize the educational impact of Dr. Abraham Rudolph, who recently passed away. His book "*Congenital diseases of the heart – Clinical-physiological considerations*" has served as a guide in educating and inspiring generations of pediatric cardiologists.

Since those pioneering days, the field of pediatric cardiology has witnessed remarkable progress, marked by cutting-edge research, transformative therapies, and innovative technologies that have reshaped the landscape of pediatric cardiac care. Noteworthy, among these advancements are the introduction of extracorporeal circuits such as the cardiopulmonary bypass and extracorporeal membrane oxygenation, the multiple surgical techniques devised to correct complex heart defects, the improved peri-operative management and intensive care, and the innovations in the field of heart

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failure therapy and heart transplantation [8–11]. Simultaneously, innovations in cardiac catheterization as transcatheter palliation of ductal dependent circulations [12, 13], closure of the patent ductus arteriosus [14], and valve placement [15] have left an indelible mark on the treatment and quality of life of young patients with heart disease. In the realm of electrophysiology, revolutionary technologies like pacemakers and arrhythmia circuit mapping have strongly contributed to improve treatment options and outcomes [16]. Advancements in imaging technologies have evolved to encompass sophisticated 3D model reconstruction and fluid dynamic studies [17]. Discoveries have ranged from the identification of new diseases with peculiar cardiac manifestations - as the multisystem inflammatory syndrome post SARS-CoV-2 infection [18] - to new insight to gene therapies for catecholaminergic polymorphic ventricular tachycardia [19]. Moreover, starting from the seminal works of Dr. Barker and colleagues, the role of fetal and early life programming of cardiovascular health and disease has risen as a key opportunity and responsibility for both paediatric cardiologists and paediatricians alike [20, 21]. With cardiovascular diseases remaining a primary source of morbidity and mortality [22], the field of pediatric cardiology has extended its purview to encompass preventive medicine and global health [23, 24], taking on a profound responsibility in nurturing the cardiac well-being of future generations across the globe.

As we present this collection, we pay homage to the contributions of these visionary pioneers and countless others, whose unwavering commitment and passion have paved the way for the *Advances in Pediatric Cardiology* that we explore in this collection. We hope that the articles showcased within these pages will not only celebrate the achievements of the past but also provide inspiration for future breakthroughs, ensuring healthier hearts and brighter futures for children worldwide.

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