

Tiny Tots and Tender Hearts

An Introduction to
Heart Diseases in
Children

R.V. Kumar

I.K. International



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and
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Dedicated to my father
Sri R. Srinadha Rao
*who was an Ardent Scholar,
Reputed Judge, and above all a great humanist*

Foreword

It gives me a great pleasure to review this book by Prof. R.V. Kumar and write a few words of introduction. The beauty of this work is the simple and easily understood way of narration about the anatomy of the heart and incidence, etiology, and various techniques used for the diagnosis of congenital heart diseases. This is followed by a detailed description of various commonly encountered lesions. Coloured illustrations of the anatomy and physiological consequences are included in each chapter to simplify the understanding of these complex heart defects.

The book also covers the valvular heart diseases, intervention procedures, pericardial diseases, infective endocarditis, conduction problems, end stage heart disease, and heart transplantation. It also discusses the expected quality of life after the correction of congenital heart diseases etc.

The book is a valuable contribution by Prof. R.V. Kumar, and focuses on simple and easily understood terms of heart defects in infants and children. This valuable information is lucidly presented as a stand-alone work, instead of being buried in the textbooks of cardiac surgery, which makes it very difficult for vast amount of readership. I hope this work will be helpful for medical students, nurses, and all other preclinical persons dealing with children suffering from heart diseases. It will also prove helpful to cardiologists, pediatricians, and cardiac surgeons. I am sure this work will provide a valuable tool for a large number of people



involved in medical care of tiny tots with ailing heart, and should be available in every facility offering such care. We wish the project a success.

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Preface

Children's heart disease is a real multidimensional problem. A number of specialists starting with general practitioners, pediatricians, obstetricians, cardiologists, cardiac surgeons and anesthetists take part in their care from birth onwards, either before, during or afterwards. Further, a host of paramedical personnel like nurses, perfusionists, counseling personnel, who are working in the above specialties, also participate in caring for these children. All these medical and paramedical personnel are expected to have a basic knowledge of disease process, etiology, diagnostic modalities, treatment options, and prognostic implications. Presently, the available information regarding these aspects of heart diseases is from voluminous textbooks of Cardiology, Pediatrics, or Cardiac Surgery. There is no book available in simple language, which is informative and can be useful as an introduction to all those who are interested in these specialties.

In the present scenario, a need is felt to introduce the subject in a simple way, which brings out the concept of disease, management options, and outcome predictions, without compromising the accuracy, complicated scientific jargons and mind-boggling statistics. With these daunting goals, a humble attempt has been made in the form of an illustrated book, which is not voluminous, is easy to carry, and can be a guide to the patients and paramedical staff in these fields. I leave it to the readers to judge how much I have succeeded in meeting these targets.

The initial chapters cover the common congenital heart defects, their causes, symptoms, how they are diagnosed, what is open heart surgery,



various management strategies and outcomes. The basics of other heart diseases such as valvular heart disease, pericardial, myocardial diseases, infective endocarditis, rhythm disturbances, and heart transplantation are also included in this book. A special chapter is introduced, which deals with the role of catheter intervention, re-operations, and re-interventions in children.

I also tried to give answers pertaining to the quality of life after surgery in these children, psychological aspects of heart disease, and chances of the disease recurring in siblings and progeny.

At the outset of this book, I would like to express my gratitude to my teachers, Prof. P. Venugopal, Prof. I. M. Rao, Prof. A. Sampath Kumar, Prof. Balram Airan, Dr. K. S. Iyer, Dr. Rajesh Sharma, Dr. Anil Bhan, Department of Cardiac, Thoracic and Vascular Surgery, All India Institute of Medical Sciences, who taught me this subject. My heart felt thanks to Jaroslov Stark, Marc R. Deleval, and Dr. Martin Elliot, who nurtured my interest in this specialty at Great Ormond Street Hospital for sick children, London. I am deeply indebted to Prof. Rajan Tandon, Prof. Savitri Srivastav, Prof. Anitha Saxena, Prof. Kothari, Department of Cardiology, All India Institute of Medical Sciences, who greatly contributed to my knowledge of diseases.

I am also grateful to the patients at Nizam's Institute of Medical Sciences and other institutes, where I worked, and also to the Senior and Junior Faculty, who constantly supported me throughout this venture.

Last but not the least, I thank my wife, Aruna and children, Srinath and Lalita who sacrificed some of their valuable family time to let me write this book.

I specially thank my publisher, I.K. International Pvt. Ltd., who has taken the sacred duty of publishing this work.

R.V. Kumar

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Heart: The Structure

The human heart has four chambers. The two upper chambers are called ATRIA (Singular: atrium), one on the right side and another on the left. These chambers receive blood from various parts of the body. They have a wall separating each other, which is called ATRIAL SEPTUM. The two lower chambers that work as pumping chambers are called VENTRICLES. The wall between these two pumping chambers is called VENTRICULAR SEPTUM. The left ventricle pumps out oxygenated blood to the various parts of the body. Whereas the right ventricle pumps out deoxygenated blood into the lungs. The main blood artery, which carries blood from the left ventricle to the various parts of the body, is called AORTA. Pulmonary Artery carries blood from the right ventricle to the lungs. Coronary Arteries supply blood to the muscular tissue of the heart. Deoxygenated blood from the lower parts of the body reaches the heart through INFERIOR VENA CAVA and from the upper parts of the body through the SUPERIOR VENA CAVA (Fig. 1.1).

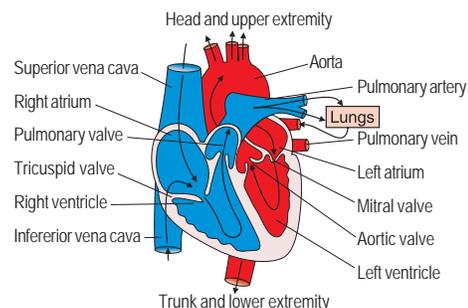


Fig. 1.1 Normal Human Heart





Heart and its Function



The heart provides circulation in the entire body. The blood circulation is divided into three main systems (Fig. 2.1):

1. Oxygenated blood going to the various parts of the body and coming back to the heart as deoxygenated blood. This system is called **SYSTEMIC BLOOD CIRCULATION**.
2. Deoxygenated blood going to the lungs from the heart and coming back as oxygenated blood. This system is called **PULMONARY BLOOD CIRCULATION**.
3. Oxygenated blood supply to the heart comes by itself through coronary arteries and deoxygenated blood coming back through coronary sinus. This system is called **CORONARY CIRCULATION**.

These three circulations continuously work efficiently as one-way traffic without jams due to the excellent structures present in the heart called **VALVES**. Let us now see how this machinery works.

1. Deoxygenated blood from various parts of the body reaches the heart through Superior and Inferior Vena Cava, into the right Atrium.
2. From this receiving chamber blood reaches the right pump, the right Ventricle, through the Tricuspid Valve. The Tricuspid Valve prevents backflow of blood into the right Atrium.





3. Right Ventricle pumps the deoxygenated blood through the Pulmonary Arteries across the pulmonary valve into the lungs. The Pulmonary Valve prevents backflow of blood into the right Ventricle.
4. Oxygenated blood from the lungs reaches the left Atrium through Pulmonary Veins. From this receiving chamber blood reaches the left pump – Left Ventricle through the Mitral Valve (Bicuspid Valve). The Mitral Valve prevents backflow of blood into the left Atrium.
5. The left Ventricle pumps the oxygenated blood across the Aortic Valve into the Aorta. The Aortic Valve prevents the backflow of blood into the left Ventricle.

Thus, the cycle of blood circulation goes on and on in a very systematic fashion to keep all of us alive.

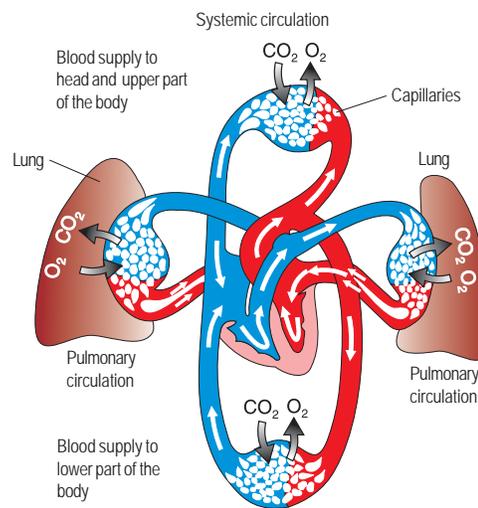


Fig. 2.1 Normal Blood Circulation



Heart and Electrical System



We have learnt about the CIVIL and MECHANICAL aspects of the Heart in the previous two chapters. Now, in this chapter, we shall learn about the Electrical System of the heart which is called CONDUCTION SYSTEM of the heart (Fig. 3.1).

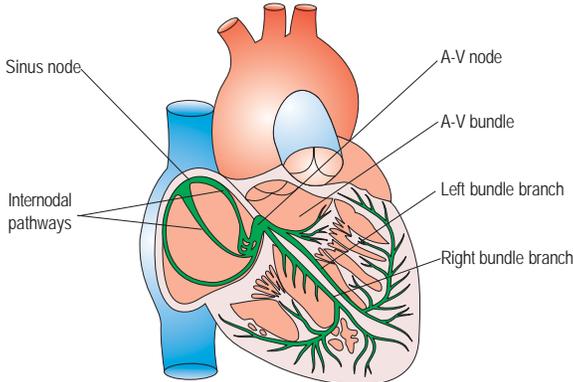


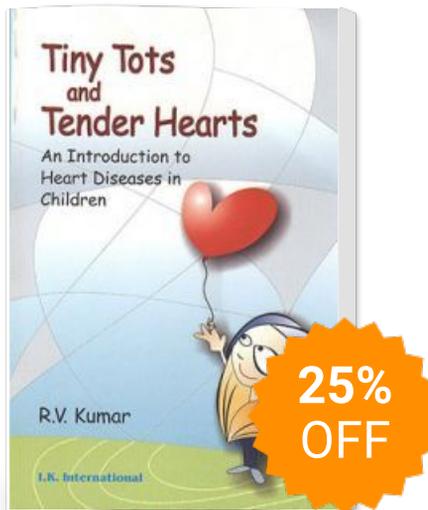
Fig. 3.1 Electrical System of the Heart

The seat of heartbeat is situated near the Superior Vena Cava in the form of specialized excitable tissue known as the Sinoatrial Node. This is responsible for our normal and regular heartbeat called THE NORMAL SINUS RHYTHM.

The second station of the heartbeat, similar but slow, in hierarchy is the tissue located in the upper part of the Ventricular Septum



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