Chapter 11
Heart Valve Diseases in the Elderly:
Current Treatments and Future Directions

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ABSTRACT

This chapter gives an overview of heart valve diseases, their diagnostics techniques, and current and future treatments with particular emphasis on the elder generation. It starts with a brief presentation of anatomy of the heart and its valves and the effect of aging on the function of the heart. Subsequently the projection of the global older population is given, and the most common and frequently occurring valvular heart diseases including aortic regurgitation, aortic stenosis, and aortic sclerosis are presented and discussed. Moreover, the current heart valve replacement techniques using mechanical or bio-prosthetic valves and the complications associated with the use of these artificial heart valves are presented and discussed. The chapter ends with a full account of the risk of mortality associated with the operation of heart valve replacement for older patients and the future directions for heart valve implementation using the tissue engineering concept.

AN OVERVIEW

The diseases that involve the heart and its arteries and veins are known as cardiovascular diseases. These include aneurysm, angina, atherosclerosis, stroke and heart attack, heart valve diseases, congestive heart failure, coronary artery disease as well as peripheral vascular diseases and present a significant health problem worldwide. Current published data indicate that and 1 in 3 people can die from impediments directly or indirectly related to cardiovascular diseases and such a rate is sig-

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nificantly higher for patients who are older than 65 years. With respect to valvular heart diseases, the American Heart Association indicated in 2003 that 15,257 deaths occurred with additional 26,336 cases due to complications related to heart valve complications. Moreover, it should be noted that valvular diseases figures are expected to increase with the age: for example for 75 years and older group, the increase was 13.3% against 0.7% for younger patient's 18-44 group and the trend is upward (Nkomo, et al., 2006; Mol, et al., 2009; Morsi, 2012).

Treatment of heart valve diseases can be either repair or replacement with artificial ones. Valve replacement is quite complex and particularly challenging for older patients and requires good surgeon's skills. Still, recently it has been recognized that the surgical treatments for both reasonably healthy elderly and young people are almost the same and the main problem in deciding on the type of treatment for elderly patients, as there is a scarcity of clinical trial data required for the corrective surgery. Subsequently, treatment guidelines are typically originated from registry and observational data, and as such any factors that affect the success of surgery and long-term outcomes need to be recorded and analyzed (Chow, et al., 2002).

Heart valve replacement with either mechanical or tissue valve has still, substantial degree of complications and risk. The mechanical type is associated with the risk of systemic thromboembolism and thrombosis as well as hemorrhage due to the use of chronic anti-coagulation treatment. Bioprothetic tissue valves on the other hand, although they possess good hemodynamic characteristics and have low rate of thromboembolism without any use of anti-coagulation treatment, they suffer from high risk of calcifications which can lead to total destruction of the valve cusps (leaflets) (Morsi, 2012). More importunely, artificial heart valves in general do not remodel and have no growth potential, which is a major restriction but mainly for growing patients. The future concept of tissue engineering may offer an alternative to these problems as fully discussed recently by Morsi (2012).

In this chapter, we are mainly concerned with heart valve treatments for elderly populations, the chapter discusses briefly the anatomy of the heart and its valves, and how the ageing process affects the functionality of the heart. Specifically it deals with valvular diseases and treatments with particular emphasis on elderly patients.

ANATOMIES OF THE HEART AND VALVES

The Heart

A schematic illustration of the heart is shown in Figure 1. Human heart is formulated from durable muscle tissues and it contracts and inflates about 100,000 times per day and pumps approximately 5.5 liter/minute in a healthy person. The volume of the heart is about the same size as person's fist and weighs about 325 grams for male and 275 grams for females. The human heart has four chambers: two atria, and two ventricles and these four chambers are regulated by four one direction valves. The heart contracts vigorously and expulsed blood from its ventricles and uninterruptedly the blood leaves the heart and progresses to the other parts of the body. Moreover, the blood flows into the ventricles from the atria which maintains the blood pumping in the forward direction into the arteries to the others organs within the body.

Anatomy and Locations of Heart Valves

Natural heart valves are extremely efficient in maintaining one direction of blood flow and have almost no resistance to the movement of the blood flow and allowing minimum amount of backflow when the shut. Generally, heart valves are categorized as atrioventricular valves and semilunar valves and these are briefly descripted below: