Chapter 13 Recent Innovations in Coronary Stents

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ABSTRACT

In heart diseases, there are frequent incidents of narrowing or blocking coronary arteries by fatty plaque deposition. As a result, blood pressure rises and the arteries weaken. This can lead to rapid rupture of the blood vessels, also known as heart attack or brain stroke. In some cases the arteries lose elasticity over old age. Heart stent or coronary stent inserts in the blocked/fragile region of coronary artery. It helps to expand the artery to allow free flow of blood and consequently, reduces blood pressure. Over past 20 years there are many modifications and innovations in the field of cardiac stents, in this chapter we will discuss few of those.

INTRODUCTION

Heart: the most important organ for mammals and birds. Heart muscles pump oxygenated blood from its left cavities (Figure 1) to different vital organs (like brain, liver, kidney) and tissues to support various cellular activities. After regional utilities, when the carbondioxide-rich blood reaches the heart (right side), it is transported to lungs to get re-oxygenated. Blood enters left ventricles of heart on its way back and again delivers oxygen to remote tissues.

In this way heart constantly works as a pumping machine that is responsible for our healthy life. With the advancement of technology, less exercise, consumption of ready-to-eat fatty food, smoking, alcoholism and stress, blood gradually develops lower ability to carry oxygen. Or, due to elevated body weight and less physical movements, oxygen carried by the blood is not sufficient to meet the cumulative demand. To combat this, heart tries to pump more blood which creates a lateral pressure on the arteries. Years after year's relatively high pressure pushes the artery walls towards sacrificing its elasticity, they become more rigid progressively. In certain cases, there is plaque like growth (mostly from fatty food) along the inner wall of the arteries. These plaques contain varying amounts of cholesterol, calcium, muscle cells, and connective tissues, a process called 'arteriosclerosis' (also atherosclerosis). Due to this

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Figure 1. Circulation of blood through heart Image adapted from http://www.bodylanguageholistic.com/

unwanted deposition when coronary arteries narrow more than 50% to 70%, the blood supply beyond the plaque becomes inadequate to meet the increased oxygen demand of the heart muscle during heavy work. Constant flow-in and flow-out push the arteries and veins towards huge pressure on the inner wall. This results in chest pain in 75% cases including shortness of breath (which comes from half functional lungs). These patients are said to have silent angina and are equally prone to a heart attack.

This even results in high-pressure build-up, which can lead to i) rupture of the arteries ii) deoxygenated heart and remote organs/tissues. Either of which, in absence of proper on-time medical intervention can bring up death in few hours. There could also be blood clot in the vessels, which can move around and while in brain can cause partial or total blockage in the arteries leading to a 'brain stroke' (also knows as, ischemic stroke). A brain stroke can be as simple as a mere dementia (partial shut off of few functions as the brain cells are dead due to lack of oxygen). In some cases a hemorrhagic stroke can also take place when a blood vessel within the brain bursts. The reason is mostly uncontrolled hypertension. This can lead up to a whole body paralysis or brain death. In addition to these major problems there are equally life-threatening complications in heart disease like arrhythmia, dysfunctional heart valve etc.

These unfortunate prognoses of cardiovascular diseases are very prevalent in any region, gender making it the most common reason for death in the world. In United States alone almost 610,000 people die from heart disease every year (Xu *et al.*, 2016), that is almost 1 in 4 deaths. Every year at least 735, 000 Americans have a heart attack, of these 525,000 is a first attack. Consequently, cardiovascular procedures performed in the United States have increased to more than three times in last decade. This increased 10 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/recent-innovations-in-coronary-stents/176220

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