



## **Coronary Artery Disease**

### **What is Coronary Artery Disease?**

The heart needs a constant supply of oxygen and nutrients, which is delivered by the blood through the coronary arteries. Blood flow can be reduced by atherosclerosis, in which plaques or fatty substances build up inside the walls of blood vessels. The plaques attract blood components, which stick to the inside surface of the vessel walls. Atherosclerosis can affect any blood vessels and causes them to narrow and harden. Cigarette smoking, high blood cholesterol, high blood pressure, overweight/obesity, physical inactivity and diabetes may cause Coronary Artery Disease.

### **Treatment of Coronary Artery Disease**

**Coronary angioplasty (balloon angioplasty):** A fine tube is threaded through an artery into the narrowed heart vessel. The catheter has a tiny balloon at its tip. The balloon is repeatedly inflated and deflated to open and stretch the artery so as to improve blood flow.

**Coronary artery bypass graft operation (bypass surgery):** Uses a piece of vein taken from the leg and is attached to the heart artery above and below the narrowed area, thus making a bypass around the blockage.

**Atherectomy:** A specially equipped catheter is threaded through an artery to a blockage, where thin strips of plaque are shaved off and removed.

**Laser angioplasty:** A catheter with a laser tip is inserted into an artery to break down plaque. The procedure may be used alone or along with balloon angioplasty.

### **Stem Cells Therapy for Coronary Artery Disease**

The Department of Medicine, Faculty of Medicine, the University of Hong Kong has reported the early success of using autologous bone marrow stem-cell transplantation regenerating normal heart muscle and blood vessels, otherwise known as myocardial regeneration, is conceptually an attractive way to restore normal function to the damaged heart in these patients. The recent clinical studies have highlighted the potential capacity to induce new blood vessels for the heart by intramyocardial injection of bone marrow stem cells. As the stem cells come from the patient's own marrow, there is no risk of rejection, and other social and ethical issues associated with stem cells from another donor. The study also

demonstrates catheter-based percutaneous delivery of the patient's own bone-marrow stem-cells into the heart muscle for blood vessel regeneration is a safe and feasible procedure in coronary heart diseases not amenable to medical or interventional therapy. This new procedure avoids the risks and complications of open-heart surgery, and can be performed under local anaesthesia as a day procedure. Up to now, 15 patients have undergone this new procedure and there is an improvement in blood flow to the heart after the procedure in all of them. Based on these initial encouraging results, further studies are ongoing to evaluate the clinical impact of this therapy in larger, controlled patient cohort.

In the US, scientists from the Hopkins group have successfully generated for the first time genetically-modified human heart cells in the laboratory using state-of-the-art tissue-engineering techniques. These human heart derivatives have also been proven to functionally integrate with recipient cells in a transplantation model. Recent studies in Hong Kong have also demonstrated that bone marrow contains many types of stem cells that can differentiate into blood vessels. The Institute of Cardiovascular Science and Medicine (ICSM), the University of Hong Kong and the research laboratories at Johns Hopkins University will collaborate on the development of tissue engineering technique. The research laboratories at Johns Hopkins University will provide the technique of laboratory genetically-modified human heart cells while ICSM will transfer the technology to clinical use. It is expected that the collaboration will facilitate the progress in the field and hence, brings new hope to cardiovascular patients.