Insights in Stem cells

Extended Abstract
Vol. 6, Iss. 3
2020

Human Umbilical Cord (HUC) Vessels: A Novel Substitute for Arterial Bypass Grafting

Biplabendu Talukdar [1,2*], Swarnendu Datta[3] , Priyodarshi Sengupta[4] , Plaban Mukherjee[5] , Ushnish Chakravarty[3]

[1]Medical College Hospital, India; [2]Kalyani University, Kalyani, India; [3]MCH, India; [4]Calcutta School Of Tropical Medicine, India; [5]Medical College Hospital, India

Coronary heart disease (CAD) is the most common cause of death and disability in developed and developing countries. Globally, 17.5 million deaths were recorded in 2012 due to this disease. Over 75% of deaths, observed in developing countries. Mortality from cardiovascular disease is declining rapidly in developed countries. While deaths or disabilities from myocardial diseases have increased in developing countries due to industrialization, urbanization, changes in dietary habits and changes in people's lifestyles. Percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CAP) is the gold standard treatment for patients with ischemic heart disease. Organ and tissue transplants can modify the disease, but the availability of donor tissue, tissue matching and organ harvesting are important parameters for a successful transplant. Recently, the human umbilical cord (HUC) has been studied extensively and current studies have revealed that the HUC can be the potential substitute for vessels, ligaments, tendons, and bones. Human cord lining epithelial cells (CLEC) do not express MHC class II HLA-DR antigen, while unclassical MHC class Ib antigen HLA-G and HLA-E has some immunomodulatory roles . The HLA-G protein decreases the production of CD8 and natural killer cells. Therefore, the human umbilical cord can be used as a substitute for artery or venous graft in vascular and reconstructive surgery. We hypothesize that human umbilical cord vessels (HUC) may be an effective new substitute for coronary artery reconstruction for those with coronary artery disease as well as peripheral vascular disease. Our hypothesis can be summarized as follows: 1. Allogenic substitute: human umbilical cord, as a natural tissue product for the reconstruction of the diseased coronary artery. It is collected from the mother of the newborn who has been screened for transmission transmitted disease (TTD) immediately after parturition in a sterile manner. Umbilical arteries / veins help in the surgical reconstruction of damaged vessels in another person. HUC containing two arteries and a vein. It is also established that the HUC is a source of goods for Mesenchymal stem cells (HUC-MSC) which can be differentiated into several lineage-specific cells which form bone, cartilage, liver, heart tissue, etc. In addition, it is also established that Wharton's jelly which surrounds the human umbilical vein (HUV) is rich in growth factors. Thus, HUC, with such a composition of MSC, living cells and growth factors, could be a promising material for the restoration of the function of the coronary artery 2. Autologous surrogate: The umbilical cord of an individual, banked right after birth, can come in handy for future use. It could be directly applied to directly reconstruct the patient's own coronary artery. We hypothesize that the autologous HUC can also be used to reconstruct the coronary artery. Autologous HUC offers the following advantages: First, HUC-MSCs could differentiate into myocardial cells in vivo after transplantation, which could promote collateral regeneration. Second, the replacement of frightened myocardial tissue by aiding the regeneration of new viable heart tissue without any immunologic transplant rejection can also be predicted. Allogeneic and autologous substitutes can be used to reconstruct the coronary artery without altering normal cardiovascular anatomy. This operation preserves the myocardial contractile function. In addition, the HUC is long enough to reconstruct the coronary artery more than once, if necessary (for example, in postoperative anastomotic stenosis).

ASSESSMENT OF THE HYPOTHESIS: The feasibility of this hypothesis is based on the following four facts: 1. Scaffolds: The diameters of the umbilical vessel from 3mm to 4mm and the coronary vessels from 3.20mm to 4.08mm in diameter are similar. The mature HUC reaches an average diameter of 1.7 cm and a length of 50 cm to 60 cm. The diameter of the umbilical artery varies from 3 mm to 4 mm and the diameter of the umbilical vein varies between 6 mm and 8 mm. The normal coronary artery is 6mm or less in diameter, with

Bottom Note: This work is partly presented at Journal of Stem Cell Research & Therapy

a range of 4mm to 8mm in adults. After choosing the umbilical vessels with the appropriate diameter, the major histocompatibility complex (MHC) cells and antigens can be removed to reduce immunogenicity without performing the decellularization process as the chemical treatment of HUC-MSC may lose the cells. precious cells and extracellular matrix. 2. Seed cells: The HUC, especially the part of Wharton's jelly and the HUC vein, is an abundant resource of mesenchymal stem cells (HUC-MSC). It is generally accepted that HUCMSCs are weakly immunogenic with the potential for multi-line differentiation. Recently, HUC-MSCs have successfully differentiated into osteocytes, cardiomyocytes, etc. HUCMSCs have the ability to renew themselves and regenerate cardiomyocytes and other essential myocardial epithelial cells. 3. Growth factors: MSCs and Wharton's jelly help release various growth factors, which are responsible for cell proliferation and differentiation. For example, epidermal growth factor (EGF) exerts a wide variety of biological effects, including promoting the proliferation and differentiation of MSCs transforming growth factor beta (TGF-β) plays an important role in the cell differentiation, secretion of BMP hormones and immune function. Fibroblast growth factor (FGF), EGF, and TGF-β have been detected in Wharton jelly extracts.

drbiplabendutalukder@gmail.com