Myocardial tissue engineering (past, present and future)

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Abstract

Tissue engineering is a multidisciplinary science that merges different fields of sciences like cell biology, physics, chemistry, material sciences, genomics, proteomics, engineering and medicine together to create biological substitutes of native tissues for doing research in lab or to use for medical application.

Tissue engineering is a promising approach to overcome the problems of shortage of organs and tissues for replacing or repairing damaged tissues or organs. Although the history of tissue engineering goes back into the last century but it is nearly 3 decades since accelerating into research in this field especially with the experimental and clinical goals.

The main progress in this field arise from 1990s that since that time tissue engineering turns from just a laboratory research field into a rapidly growing industry. With industry application of tissue engineering more research funds invests into the research labs and therefore this field of science due to earlier mentioned reasons and especially due to regenerative medicine and clinical application needs has an extremely promising future.

In the past tissue engineering considered as a part of biomedical sciences but it is now more considered as a multidisciplinary field of science. Tissue engineering is now used in many fields of biological sciences and medical sciences and has many experimental and clinical applications (e.g. to replace or repair organs or tissues like bone and cartilage,...).

In this presentation the past of tissue engineering and its application in regenerative medicine will briefly discussed and then I spend more time on the myocardial tissue engineering (MTE) as the main scope of this presentation.

Cardiovascular diseases (CVDs) and especially myocardial infarction (MI) are the number one cause of mortality and morbidity in the developing countries. It is also one of the main cause of mortality and morbidity in the developing and rest of the world countries.

There are many routine therapy methods following MI like oxygen therapy, beta -blockers medication therapy or injection of Heparin or to administrate anti platelet medications like Aspirin or Clopidogrel to inhibit blood clots in the coronary artery to restore blood flow in the blocked coronary .

Myocardial scar formation and myocardial infarct size are large and the damages are irreversible. To help the damaged myocardial tissue back to normal function also seems need new therapy approaches in addition to previous routine therapies that earlier mentioned.

Myocardial tissue engineering needs some constructs that they should have those like biocompatibility, Mechanical integrity, biodegradability, being cell friendly, biomimetic and also have fabrication capability.

In this presentation after this introduction I discuss advantages and disadvantages and success and failures of MTE in details. The goal of this presentation is to give a better idea on the past, present and the future of the MTE.