Scientist develop technique for eliminating reblockage of arteries

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An easily implementable technique to avoid reblockage of arteries that have been cleared through angioplasty and stent insertion has been developed by researchers led by Prof. Boris Rubinsky of the Hebrew University of Jerusalem.

Angioplasty is the "gold-standard" treatment for acute myocardial infarction (heart attack), which is the result of abrupt interruption in blood supply to part of the beating heart, usually due to plaque-rupture in an atherosclerotic (hardened) coronary artery.

In angioplasty, a cardiologist dilates the blocked artery by inserting a balloon that is inflated at the point of blockage. This is usually followed by coronary stent implantation to protect the artery and prevent restenosis (reocclusion or reblockage). However, the procedure damages the arterial wall, and therefore restonosis of the dilated artery remains a major clinical problem in cardiology, as well as in other fields of clinical medicine.

Since heart disease remains the leading cause of mortality in the western world, the technique developed by Prof. Rubinsky's research teams offer a highly valuable tool for dealing with cardiology patients. Prof. Rubinsky is the director of the Center for Bioengineering in the Service of Humanity and Society at the Rachel and Selim Benin School of Computer Science and Engineering of the Hebrew University of Jerusalem and a professor in the graduate school at the University of California, Berkeley.

The technique employs the biophysical phenomenon of irreversible electroporation (IRE). IRE destroys cells within seconds, using very short electric field pulses. It causes no damage to structures other than the cells themselves. Compared with other technologies for local destruction of cells and tissue, IRE is simple and does not require special training of the medical team.

In IRE, electrical fields are applied across targeted cells, penetrating the cell membranes, This process leads to cell death, since the electrical fields cause permanent damage to the membranes and the consequent loss of cell stability. The electrical fields damage only the cell membranes, with no collateral damage to other structures in the treated area. While the phenomenon of irreversible electroporation was known for decades, a team led by Prof. Rubinsky developed a new mode of application that affects only selected molecules in tissue, and as a consequence it has become only recently rigorously considered in medicine for various applications of tissue removal.

In an article published March 9 in the journal *PLoS ONE*, Prof. Rubinsky's team demonstrated that IRE can efficiently, safely and quickly destroy the cells responsible for the restenosis phenomenon in rats. In the study, IRE successfully destroyed almost all of those cells in less than 23 seconds, with no damage to any other structures. Clinical trials on humans for restenosis treatment are planned in the near future.

IRE has been recently used for the first time on human subjects in Melbourne, Australia, for the treatment of prostate, liver and lung tumors. Clinical trials for follow-up through IRE of angioplasty treatments are planned for the near future. Prof. Jay Lavee, head of the heart transplant unit at the Sheba Medical Center, Tel Hashomer, is cooperating with Prof. Rubinsky in development of the IRE technique for heart patients.

Source: The Hebrew University of Jerusalem