Blood Flow Simulating Device

KEYWORDS

In vitro testbed
Blood flow simulator
Artificial cardiovascular technology
Cardiovascular medical devices

PATENT

Title: device for simulating blood flow.
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LICENSING

Research collaborations
License agreements

INVENTORS

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PROBLEM

Cardiovascular diseases are still among the top causes of mortality and morbidity in the world, with a number of deaths in 2008 estimated at 17.3 million (2011 World Health Report). The main objective of our research was to conceive, build and control a new *in-vitro* testbed that mimics the pulsatile flows behavior that are present in vivo in the cardiovascular system. **The goal of the blood flow simulating device is to better understand the behavior of the circulatory system and find more efficient means of fighting against cardiovascular diseases.** For instance, **once an unruptured aneurysm has been detected**, physicians have to rely entirely in their experience and reported cases to evaluate the chances of the aneurysm to rupture and what type of therapeutic approach to choose. Little is known about the healing mechanism, namely the formation of a clot inside the cavity after insertion of a stent, and the use of our simulating device can help better understand this mechanism and, among other possible applications, help train surgeons in placing vascular prostheses in specific situations. For instance a specific shape of aneurysm (based in a patient's real case) can be modelised in silicon and placed into the device.

SOLUTION

The invention proposed is an *in-vitro* device reproducing cardiovascular hemodynamic conditions. This device allows to study the modification of flow induced by the placement of a vascular prosthesis and the effects on endothelial cells. **The system also has the capability to reproduce physiological and pathology signals**. This testbed is easy to work, mobile, as automatic and compact as possible and it can easily be adapted to work with additional supporting equipment. The system adapts itself to the external and internal environmental changes. The testbed is capable to automatically record desired measurement data such as flow, pressure, temperature or/and take pictures of examined ECs while system is running. Finally, it is made of material such as plexiglass and inox steel, which will not undergo destruction during the sterilisation process.

INNOVATION

- Control any real in vivo pulsatile flow rate
- Not invasive for the patient
- Compatible to sterile conditions
- Possibility to use whole blood
- Fully automatic and easy to use controls

TECHNOLOGY STATUS

TRL 6 : a functional prototype system is being tested in a simulated environment.

MARKETS

- **Support in aneurysm surgery decision-making** by analyzing in-vitro a silicon model of the patient's aneurysm, placed in realistic pulsatile conditions. Questions such as the following can be answered: Should surgery be undertaken? Should a vascular prosthesis be placed?
- **Testing of vascular prostheses** in a realistic pulsatile in-vitro environment. This may help designers and producers of vascular prostheses design and test their products before having to run tests in animal subjects.
- **Training device** for surgeons in the placement of vascular prostheses in a simulated in-vivo conditions.

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