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Fondazione IRCCS
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Regione
Lombardia

VASCULAR SIMULATION DEVICE FOR MEDICAL TRAINING IN US-GUIDED PROCEDURE

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Applications:

1. Medical specialized training.
2. Material and device testing, development and optimization.
3. Pathophysiology and patient-machine interaction study.



Key benefits:

With respect to the already available platform on the market:

1. Anatomical customization to consider different anatomical variations or pathological conditions.
2. Soft tissue echogenicity, mechanics combined with lack of visibility from the outside as in the real scenario.
3. Difference of visibility and mechanical response between arteries and veins.
4. Adaptability to standard mannequins.
5. Possibility to connect the pad to an external fluido-dynamic circuit.
6. Small footprint: the consumable part used to mimic soft tissue can be recovered and reused approximately 10 times.



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VASCULAR SIMULATION DEVICE FOR MEDICAL TRAINING IN US-GUIDED PROCEDURE

INVENTION

Simulation device replicating the echogenic and mechanical properties of soft tissues and vascular structures for medical training in US-guided procedure (e.g. cannulation).

BACKGROUND

Simulation is becoming a core component in medical training, both for surgical and interventional procedure. Especially for complex maneuvers, such as the cannulation for extracorporeal circulation, the operator's learning curve reflects the balance between patient's safety and need for acquisition of technical skills. Moreover, non-technical skills related to the interaction with the other members of the team have to be developed by the physician in performing such kinds of procedures in emergency situations. Currently on the market there are mainly two types of simulators: on one hand highly complex but expensive platforms and on the other hand cheap but extremely simplified phantoms with a low level of realism. There is a lack of a realistic, low-cost and recyclable platform for the simulation of invasive ultrasound-guided procedures for training purposes and testing of new devices for extracorporeal circulation.

TECHNOLOGY

The proposed solution responds to the issues of existing products, with the following technologies:

- Anatomical realism: 3D reconstruction starting from radiological data and 3D scans. Customized production through 3D printing.
- Echogenicity combined with lack of external visibility: ballistic gelatin with additives (i.e. graphites) to increase echogenic properties and hide the internal structures from the outside.
- Stable arterial and venous system connected to a pulsatile circuit through specific connectors.
- Mechanical properties: ballistic gel to resemble soft tissues, silicon to recreate the artery and a particular layered manufacturing process linked to the presence of ballistic gel to recreate the vein.
- Modularity and portability: pad housing system made up of different elements that can be assembled and disassembled according to the user's needs. Together with the pad, the system can be stored in a small suitcase.
- Adaptability to standard mannequins: the pad housing system can be assembled and positioned inside an empty commercial mannequin without purchasing a complex and expensive system.
- Customizability: new sections (e.g. cannulation sites) and different anatomical variations or pathological conditions can be included according to the user's needs.

INVENTORS

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Patent application in Italy.

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