Ottava Giornata della Ricerca della Svizzera Italiana
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Modulo per la sottomissione abstract ricerca di LABORATORIO

Titolo (massimo **15 parole**)

Design of 3D-mesoscale systems for the development of vascularized tissues through experimental and computational methods

Autori (cognome e iniziali, es: Grassi L.)

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Testo (massimo **250 parole**, preferibilmente in italiano (accettato anche in inglese), suddiviso in Introduzione, ***Metodi***, ***Risultati***, ***Conclusioni*** e ***Finanziamento***

Introduction
Vascularization is currently one of the major challenges in tissue engineering. The in vitro generation of perfusable vascular networks, able to transport oxygen and nutrients up to the inner part of cellular constructs, represents a fundamental step to obtain engineered substitutes with a clinically relevant size.
Methods
Mesoscale masks for perfusion of vascularized three-dimensional cell constructs were designed and fabricated using high resolution 3D-printing. The 3D-printed masks were filled with fibrin hydrogels at 3, 4 and 5 mg/ml concentration, containing GFP HUVECs and MSCs. HUVECs were used at 3, 4, 5 and 6 Mcells/ml final density, while MSCs/HUVECs ratio was set at 1:10. Samples were cultured with a FBS-VEGF conditioned EGM-2 medium. The obtained neovascularization was reconstructed using Amira (ThermoFisher Scientific) and submitted to computational (CFD) simulations to evaluate velocity magnitude and shear stress (WSS) distributions using COMSOL Multiphysics (COMSOL Inc.)
Results
The most branched and homogeneous network was obtained with 5 mg/ml concentration for fibrin hydrogel and 3 Mcells/ml for HUVECs density. The obtained vessels appeared wide spread, hierarchically organized and characterized by an open lumen and an elevated grade of interconnection.
CFD simulations allowed verifying that maximum velocity and WSS values (0.189 mm/s and 1.87 Pa, respectively) remain into physiological ranges, assuming open vessels with an inlet velocity of 0.1 mm/s.
Conclusions
3D-printed masks are promising devices demonstrating the possibility to support the vascularization on mesoscale environments with hierarchical organization of obtained vessels, recapitulating velocity and WSS of physiological capillaries.

Visto superiore (prego indicare Nome e Cognome del superiore)

Matteo Moretti

Criteri per sottomissione Abstract:
NO Case report
NO Abstract senza nessun risultato
VISTO da un superiore

Invio Abstract