CONVERGENCE OF PRINTING TECHNOLOGIES TO ENGINEER AN INTERFACE BETWEEN BONE AND CARTILAGE

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The combination of multiple three dimensional printing technologies can aid the generation of osteochondral grafts that display a strong interface between the cartilage and the bone compartment. In this study, the integration between bone biomimetic a three-dimensional (3D) printed calcium phosphate paste (PCP) and a gelatin methacryloyl (gelMA) hydrogel substrate for cartilage, was reinforced with a PCL mesh produced by melt electrospinning writing (MEW). The PCP was composed of alpha- tricalcium phosphate, nano-hydroxyapatite and a crosslinkable poloxamer and porous scaffolds were fabricated using an extrusion-based printer. For reinforcement of the interface, the PCP was printed directly over the PCL mesh. Subsequently, gelMa was infused into the mesh and on top of the PCP, to create a biphasic osteochondral construct, so that the PCL mesh acted as an anchor between the hydrogel and the PCP. Finally, chemical crosslink between gelMA and PCP scaffold was eventually performed. The strength of an integration was measures by using Dynamic Mechanical Analyzer attached with a custom-made holder for an application of force in parallel direction with an interfacial surface between bone and cartilage compartment. The results demonstrated that an average of the strength of the constructs with an anchored PCL mesh were seven times higher than of the constructs without an anchored PCL mesh. As a result, an integration between bone and cartilage compartment of an osteochondral construct can possibly be produced by combining multiple 3D printing technologies. Controllable deposition of the material can ensure the area of an attachment between different materials which thereafter improve the strength of their integration.