Appendix A

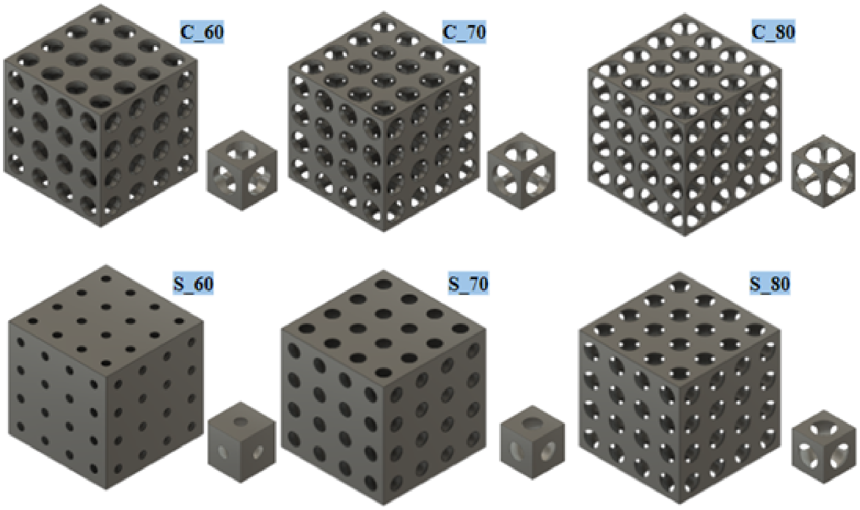


Fig. A1 Scaffolds were designed with three different porosities (60%, 70% and 80%) and two geometrical pore configurations; cylindrical and spherical.

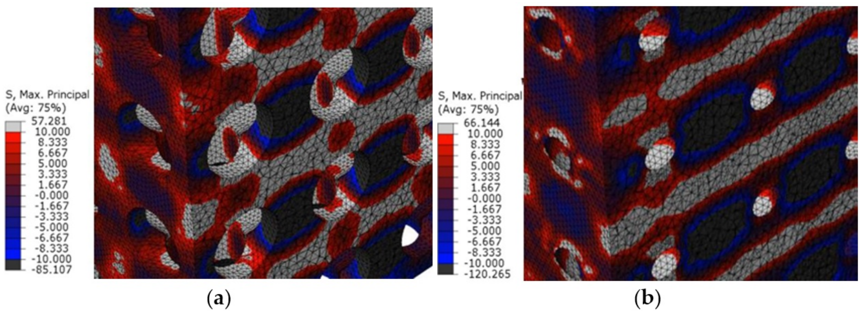


Fig. A2 View of the 60% porosity scaffolds showing the absolute stress and strain scale, highlighting the compression areas in blue and black and the tension areas in red for: (a) 60% cylindrical porous scaffold; (b) 60% spherical porous scaffold.

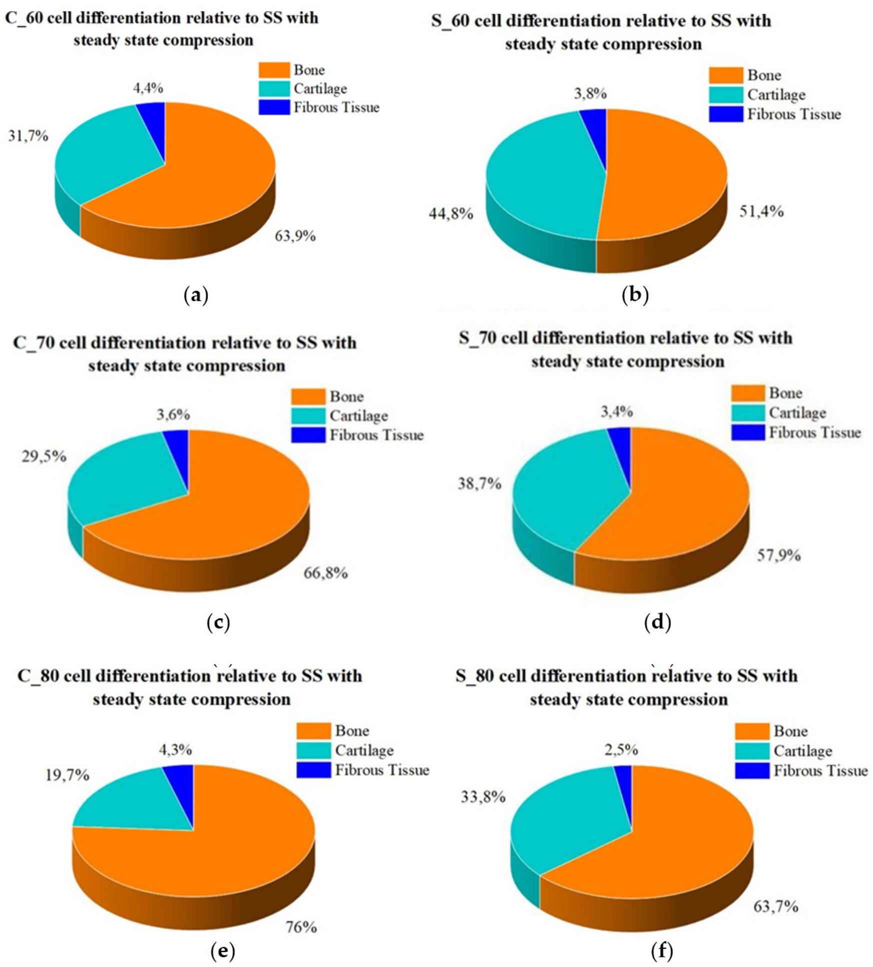


Fig. A3 Cell differentiation analysis relative to Shear Strain (SS) results in the superficial nodes using Computational Solid Mechanics (CSM) at steady state compression for: (a) 60% cylindrical porous scaffold; (b) 60% spherical porous scaffold; (c) 70% cylindrical porous scaffold; (d) 70% spherical porous scaffold; (e) 80% cylindrical porous scaffold; (f) 80% spherical porous scaffold. Being bone differentiation orange, cartilage differentiation light blue, and fibrous tissue differentiation dark blue

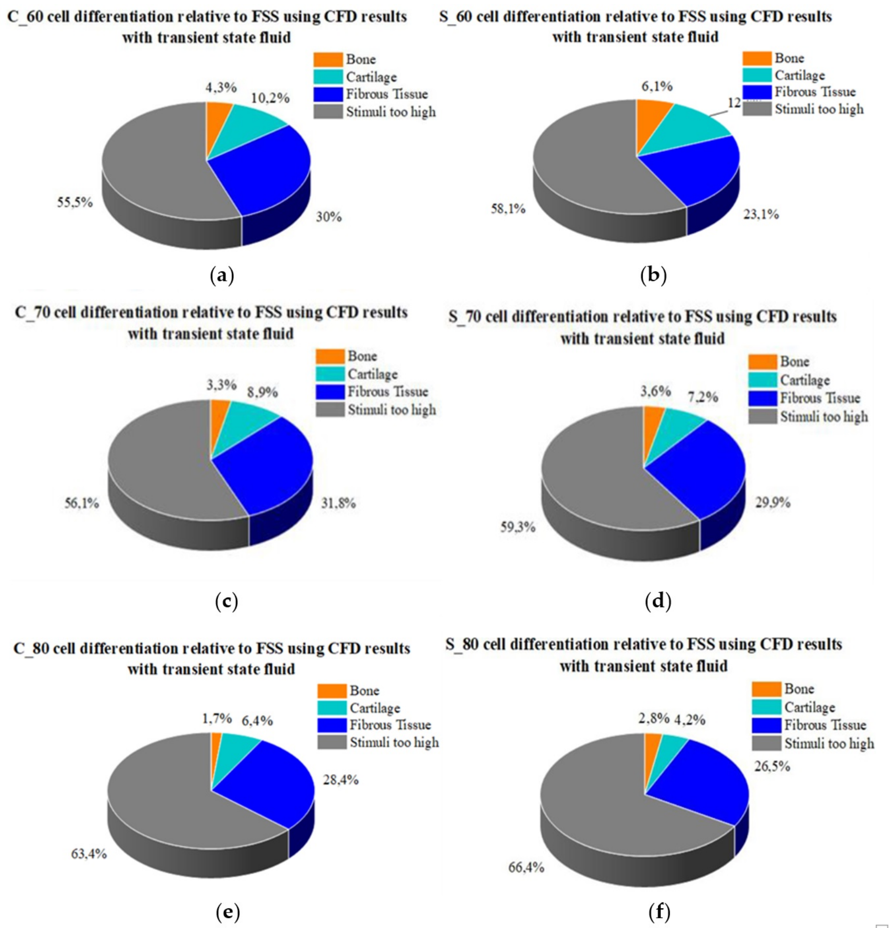


Fig. A4 Cell differentiation analysis relative to Fluid Shear Stress (FSS) results in the superficial nodes using Computational Fluid Dynamics (CFD) at steady state inlet for: (a) 60% cylindrical porous scaffold; (b) 60% spherical porous scaffold; (c) 70% cylindrical porous scaffold; (d) 70% spherical porous scaffold; (e) 80% cylindrical porous scaffold; (f) 80% spherical porous scaffold. Being bone differ-entiation orange, cartilage differentiation light blue, and fibrous tissue differentiation dark blue.

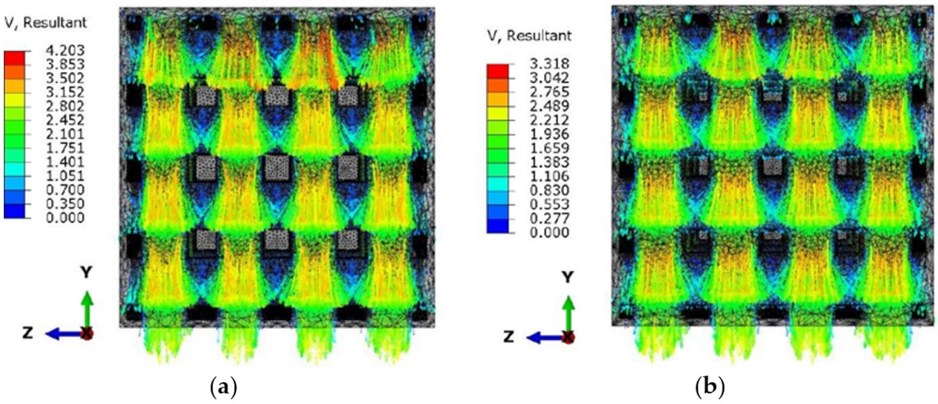


Fig. A5 Computational Fluid Dynamics (CFD) simulation results showing the velocity vector map re-sults at maximum fluid perfusion equal to 1 mm/s for: (a) 60% cylindrical porous scaffold; (b) 60% spherical porous scaffold

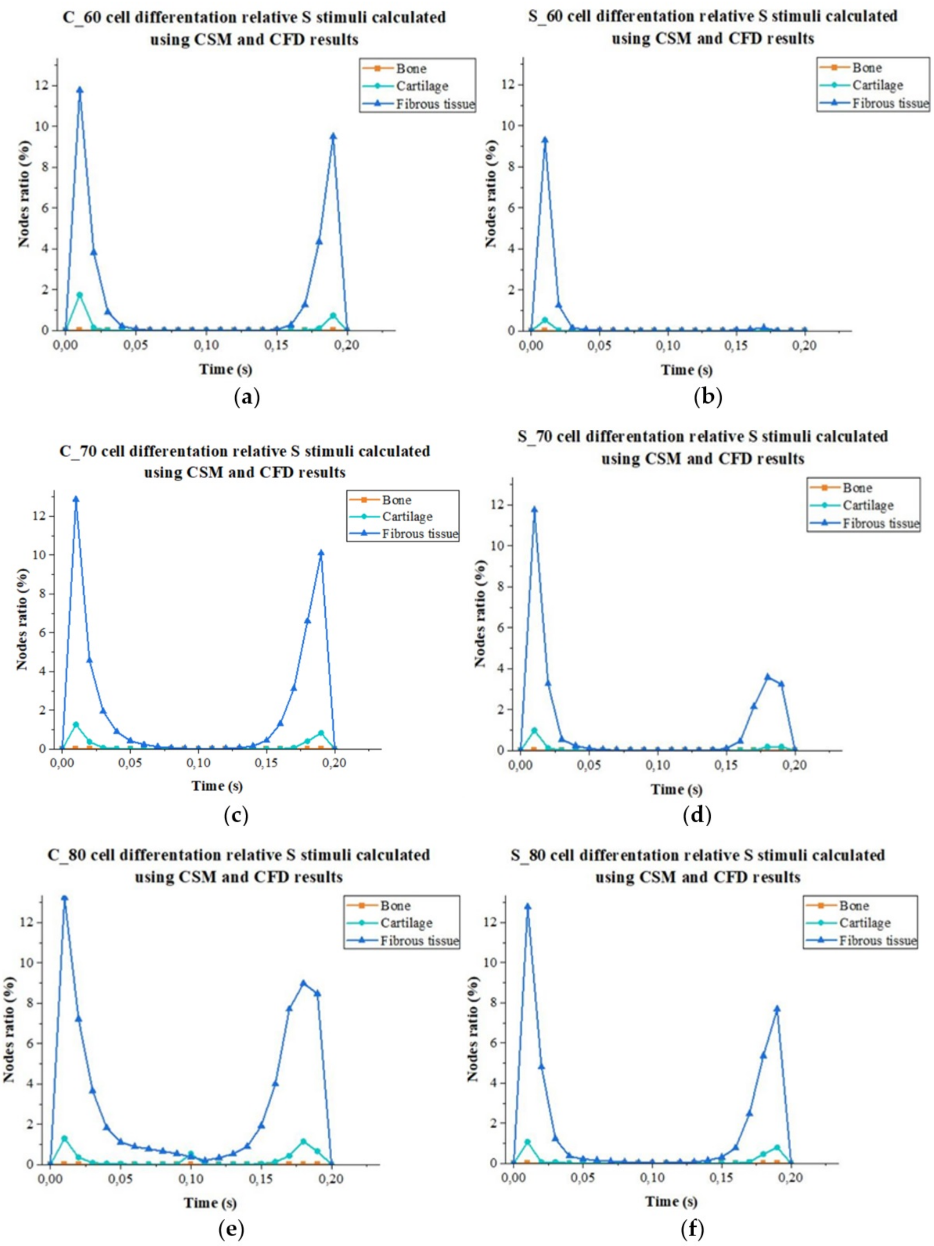


Fig. A6 Cell differentiation analysis relative to S stimuli calculated with Equation 3, using the Fluid Shear Stress (FSS) results obtained with Computational Fluid Dynamics (CFD) models at transient fluid perfusion and Shear Strain (SS) results obtained with Computational Solid Mechanics (CSM) models at dynamic compression for: (a) 60% cylindrical porous scaffold; (b) 60% spherical porous scaffold; (c) 70% cylindrical porous scaffold; (d) 70% spherical porous scaffold; (e) 80% cylindrical porous scaffold; (f) 80% spherical porous scaffold. Rescaled axis and presenting bone differentiation orange, cartilage differentiation light blue, and fibrous tissue differentiation dark blue.

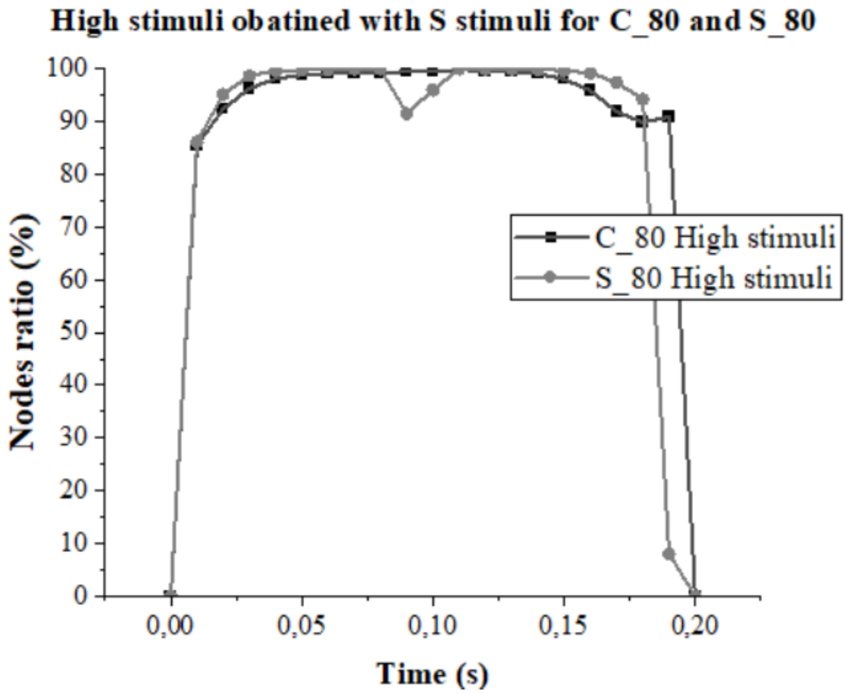


Fig. A7 High stimuli obtained after calculating S stimuli using Fluid Shear Stress (FSS) ob-tained performing Computational Fluid Dynamics (CFD) and Shear Strain (SS) ob-tained performing Computational Solid Mechanics (CSM) simulation. 80% cylindrical porous scaffold is presented in black and 80% spherical porous scaffold in grey.

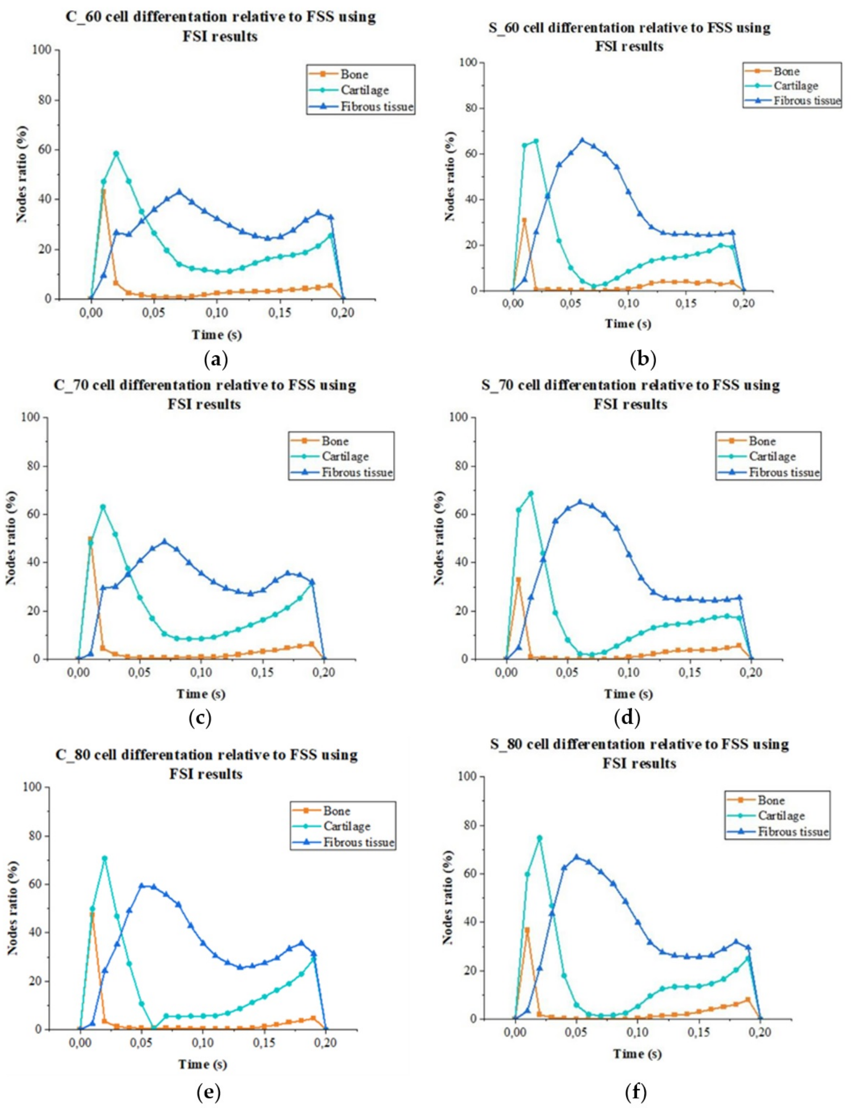
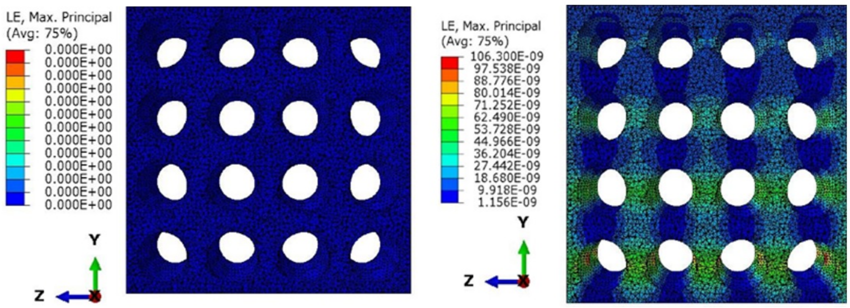
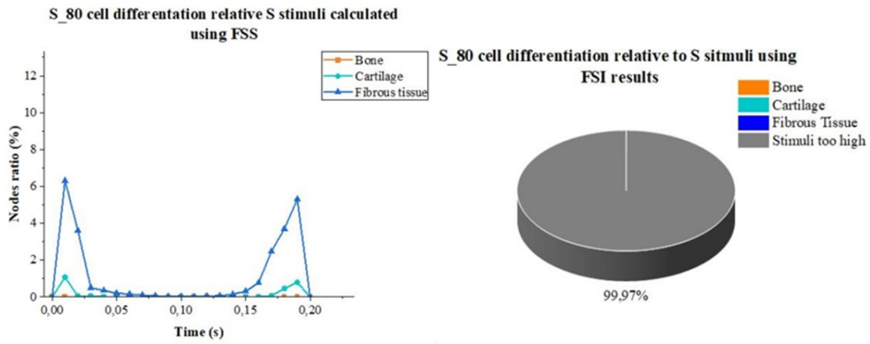


Fig. A8 Cell differentiation analysis relative to Fluid Shear Stress (FSS) results in the superficial nodes using Fluid-Structure Interaction (FSI) at dynamic transient state fluid profile with no compression for: (a) 60% cylindrical porous scaffold; (b) 60% spherical porous scaffold; (c) 70% cylindrical porous scaffold; (d) 70% spherical porous scaffold; (e) 80% cylindrical porous scaffold; (f) 80% spherical porous scaffold. Being bone differentiation orange, cartilage differentiation light blue, and fibrous tissue differentiation dark blue.



(**a**) (**b**)

Fig. A9 Shear strain (SS) colour map of 80% sphere porous scaffold caused by the fluid stimuli: (a) Before the fluid was perfused; (b) After the fluid was perfused



(**a**) (**b**)

Fig. A10 Cell differentiation results relative to S stimuli obtained implementing a Fluid-Structure Inter-action (FSI) model with 80% sphere porous scaffold: (a) Using Fluid Shear Stress (FSS) with steady-state fluid and static compression; (b) Using Fluid Shear Stress (FSS) with transient state fluid and dynamic compression

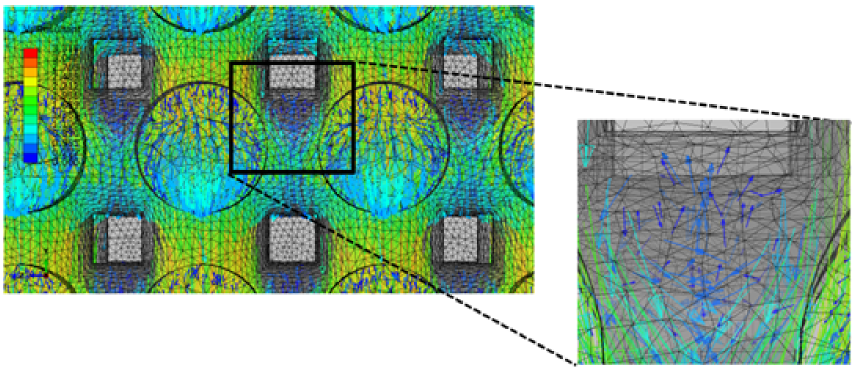


Fig. A11 Computational Fluid Dynamics velocity vector colour map results at maximum fluid perfusion equal to 1 mm/s. Furthermore, a zoom is conducted to show how the fluid flows collide and then impact the wall of a 70% cylindrical porous scaffold.