The influence of atomization on the properties of calcium phosphate cements

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Resumo:
Calcium phosphate cements (CPCs) are promising candidates to be injected during minimally invasive procedures, since they have the ability to form a moldable paste that hardens spontaneously which ensures stability to the implanted site. However, many CPCs formulations present difficulties during the injection (e.g., needle clogging and paste inhomogeneity) and, consequently, only a partial extrusion of the paste takes place. There are many ways to improve the injectability of CPCs, such as increasing the liquid-to-powder ratio, through the addition of citrate ions and the use of round particles. However, one should take into account that some of these strategies can potentially affect the intrinsic properties of cements, e.g. an increase in the L/P would cause a decrease in their mechanical properties. The present work explores the potential of using spherical particles in the formulation of cements to improve injectability while assessing their effect on other CPC’s properties like the compressive strength. Thus, the purpose of this study is to use atomized [alpha]-tricalcium phosphate (\(\alpha\)-TCP) powder as solid phase in the formulation of apatite calcium phosphate cements and to verify its influence on the cement’s properties. For comparison purposes, cements prepared with a non-atomized \(\alpha\)-TCP powder will also be included. The cements were characterized by X-ray diffraction, scanning electron microscope, mechanical strength, setting time and injectability. It was observed that, besides improving the injectability of the cement, the atomized powder improved significantly the compressive strength of this material.