
ABSTRACT

Mechanical, optical and surface properties of a composite to three-dimensional (3D) printing reinforced with nanofibers of niobium, bioactive glass and nanosilver.

Rapid and automated prototyping (3D printing or additive manufacturing) have been hailed as a disruptive technology that tends to change the course of different production areas. The focus of our studies has been on technological strategy which allows to reduce the cost and chair time, boosting the work flow approach and comfort to the patient associated to the use of bioactive materials that promote tissue regeneration or repair in restorative dentistry. Aiming to understand and improve the properties of a composite for 3D printing with dental applications, this research was developed in 2 parts with specific objectives. In the first study, commercial 3D-printable resin for interim restorations (Next Dent C&B) was compared *in vitro* to two restorative materials (Filtek - Z350 and Protemp - 4) in relation to mechanical, optical and surface properties. The second study was conducted with the aim of synthesizing bioactive reinforcing nanofibers (niobium pentoxide, bioactive glass and nano-silver), incorporating them into a resin for 3D printing and to evaluate *in vitro* the effect on mechanical, optical and material surface properties. In the first study, the results showed properties suitable for use in interim restorations and highlighted its potential for a clinical approach in digital workflow. However, it also observed a concern about long-term color stability. The second study showed that the incorporation of nanofibers in the tested formulations modifies the mechanical, optical and surface properties of the resin for 3D printing at specific concentrations. In general, the studies support the use of 3D printing technology to interim restorations and highlighted the need for improvements regarding long-term color stability. In this gap, the reinforcement of niobium-based nanofibers, reveals to be a potential additive. These findings are of special interest to solidify the use of 3D technology and workflow approach in dentistry.

Key words: 3D printing. Composite. Nanofibers
