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Editorial

Aditive Manufacturing in Maxillofacial Prosthodontics

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Additive manufacturing (AM) or additive layer manufacturing (ALM), defined by the International Organization for Standardization and American Society of Testing and Materials (ISO/ASTM 52900) as the "process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies" [1] is a versatile technology, turning 3D digital designs into actual functional parts, with wide application in the medical and dental field.

Congenital or acquired maxillofacial disabilities are complex, causing impairment of sense, esthetic compromises, and functional loss with severe alterations in patient's quality of life. The existing complex anatomical structures and the complicated facial morphology with difficulty to restore symmetry, make the reconstructive surgery hard to achieve, in many clinical cases. Due to high risk of graft rejection, donor site morbidity, prolonged healing time, lack of vascularization in tumor cases and additional patient discomfort, alloplastic reconstruction of the defect is preferred. In these cases, additive manufacturing and a variety of materials with improved characteristics can offer a viable alternative for replacing intraoral or extraoral anatomical structures [2].

AM has several advantages over conventional techniques as well a over the CAM subtractive techniques. Some of the main advantages are: the ability to rapid fabricate complex structures at a considerably reduced cost [3]; a full or partially digital workflow with integrating patient's data (Cone beam computed tomography—CBCT, intraoral scan, facial scan), design in a large variety of CAD software and manufacturing carried out directly by printing the prosthesis itself or indirectly by printing prosthesis prototypes or molds [4]; less material waste; possible to reprint molds without the need of designing them again [5]; availability of different type of materials mimicking the defects needing to be restored (soft or hard tissue) [2]; constant improvements in material characteristics by adding different components [6] or improving in manufacturing techniques [7].

However, for restoring such complex defects, in close contact to the living tissues, maxillofacial prosthesis manufactured via 3D printing need to mimic the visual and tactile properties of the replaced tissues, being simultaneously physical and chemical stable, having good biocompatibility as well as having microbiological residence [8].

In spite of the major progresses registered by AM, to date no commercially available material meets all the parameters of the optimum material for 3D printing maxillofacial prostheses.

Therefore, further studies for optimization of printing parameters and their correlation with 3D printability of biocompatible materials, with improved mechanical properties, need to be performed.

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