A Brief Discussion about the Use of Technologies in Life Sciences: Review and Future Perspectives

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Introduction

The introduction of digital technologies in dentistry is changing the workflow inside dental offices and laboratories, expanding the possibilities for each clinical case through introduction of new materials and techniques [1,2]. Despite the fact that computer-aided design/ computer-aided manufacturing (CAD/CAM) and digital scanning systems are not exactly new, their accuracy and reliability are under fast improvement and probably, in a few years, will dominate dental offices and dental schools. The versatility and possibility of a faster workflow since the prosthesis can be digitally fabricated, reducing the necessity of specific and expensive impression materials, associated with faster and more comfortable clinical sessions [1,3-9] should be enough to sell this kind of technology. In fact, the use of digital models as diagnostic tool in USA has been used by around 40% of the clinicians, with a decrease of conventional impressions [6,8,10]. In order to allow the use of the CAD/CAM systems, professionals can choose between direct digitalization (intraoral digital impression) and indirect digitalization (stone cast/impression material scanning) [1,11].

Another advantage consists in eliminating some errors that are inherent to the impressions and cast materials such as impression distortion, gypsum hygroscopic expansion, as well as laboratory errors that could lead to a failure (misfit) of the final prosthesis. In addition, It could eliminate the risk of cross-contamination due to contaminated impressions sent to laboratories [1,3-8,12-14]. Nevertheless, one of the main questions about the use of direct (intraoral scanners) or indirect (impression or cast scanners), despite all those advantages, relies on its

accuracy, [15] which consists in the interaction between the trueness (how close the scanned image is to its reference) and the precision (how reproducible the scanned dimension are with repeated scans) [1]. There are several reports in literature showing that digitizing process, despite being technical sensitive, shows similar-to-higher accuracy when compared with conventional impressions [15,16]. However, the accuracy for implant cases is still limited and under investigation [8,17,18]. It is clear that further controlled studies are still necessary to address the reliability of those technologies in very complex cases, but analyzing how fast those technologies develop, it seems to be safe to state that is "just a matter of time". It is also interesting to note the different approaches for those technologies and the interaction with the previously existing ones, such as the possibility of development of a prosthesis (dental and medical) based on computer-tomography (CT) scans and CAD/CAM designs, even in complex cases [19]. Use of 3d printed models based on CT scans is also a reality that dentists and medical doctors are using to plan and prepare for surgical procedures before getting to the operation rooms.

More recently, the use of 3D printing and similar methods also has been used for creation of artificial organs and prosthesis. The authors believe that its application in Dentistry will happen soon. In fact, some authors have already been using such technologies to create dental models and surgical guides with success. In addition, some researchers reported great adaptation results comparing 3d printed and milled crowns [20]. Another future possibility is the use of CAD/CAM based implants and grafts, [21] reducing the surgical time and morbidity, with potential to increase the results due to an

improved adaptation between the material and the surgical site. Also, the possibility of confectioning 3D printed or milled biomaterial-based scaffold with steam-cells and/or drugs can lead to a great improvement in dental and medical sciences in the future, enhancing the outcomes of different treatments.

Conclusion

In conclusion, it is exciting to observe how the technologies developed so far, and the future perspectives with potential to contribute to development of treatments, techniques, and materials, allied to saving costs, enhancing the patients comfort as well as the outcomes.

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