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### Digital impressions in dentistry: A literature review

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#### Abstract

The importance of this research lies in knowing the effectiveness of digital impressions in dentistry.

**Methodology:** A compilation of articles published in the last 5 years was carried out using the PubMed electronic database. Abstracts and full texts were identified that included information on factors that influence digital impressions in dentistry: "scan", "time", "impression", "digital", and "conventional".

**Results:** An intraoral scan is faster and more accurate than a conventional impression. The scanner does not allow us to obtain a termination line if it is subgingival, as well as the pixel capacity, it can also provide us with a patient model in a more straightforward and more comfortable way. It allows us to have a future visualization and a record of before and after each treatment.

**Conclusions:** Digital impressions have brought innovation to impression-taking and have partially set aside conventional methods. They offer significant advantages, such as time efficiency, patient comfort, simplification of clinical procedures, and storing and capturing information that can be used over time. They also facilitate diagnosis and treatment planning. Among the disadvantages of using it are the high cost and the existence of a learning curve for the use of intraoral scanners.

**Keywords:** Scanner", "time", "impressions", "digital", "conventional"

#### Introduction

In recent decades, digital systems have had an important impact on dental practice <sup>[1]</sup>. The digital flow through CAD/CAM has allowed the fabrication of restorations in less time <sup>[2]</sup>.

The initial step to carry out rehabilitation is the taking of a dental model <sup>[3]</sup>. For decades, polyvinyl siloxane has been used as an impression material with drawbacks in impression technique, consistency, taste, and smells <sup>[4]</sup>. In the early 1970s, Dr. Francoise Duret implemented intraoral scanning technology for an indirect restoration for the first time <sup>[5]</sup>. Initially, the digitization of study models was used to later perform restorations with milling in CAD/CAM equipment. Now we can directly perform our oral scan on our patient without the need to use a physical model <sup>[6]</sup>. The evolution of this scanning system has helped us create a faster, more efficient, and more accurate flow for rehabilitation in the dental field <sup>[7]</sup>.

The patient feels more comfortable when making a digital model compared to a conventional model, as it allows us to avoid the risk of losing the model or causing any damage that alters our result in the laboratory and provides us with more sustainability <sup>[8]</sup>. Other benefits are performing a restoration more quickly, reducing the cost of producing treatments, making it more practical, and reducing the waste of materials <sup>[6]</sup>. This leads us to consider the capacities and characteristics, both operational and physical, such as the size of the tip and its image capture speed and precision <sup>[1]</sup>. There are two very important factors that can cause treatment to fail. These are the lack of long-term planning of the materials and their durability for treatment and the use of different intraoral scanner equipment <sup>[5]</sup>.

Due to the fact that there is currently no standard technique for taking digital impressions, it is not possible to guarantee excellence in taking digital impressions since there is a large amount of equipment for intraoral scanning <sup>[9]</sup>. Patients must have an alternative that provides them with greater comfort in their treatments. A very important factor to consider is that conventional materials can cause allergic reactions in our patients <sup>[4]</sup>. In addition, they require working and setting time, which sometimes causes anxiety and stress in our patients. Intraoral scanners help us not only present a study or work model and give more efficiency when working, but also create a whole plan.

Treatment that fully focuses on restorations created digitally and allows us to handle the case more easily <sup>[10]</sup>. Therefore, it is essential to look for alternative methods to improve the results in patients in prosthetic and implant dentistry. With this, we intend to analyze the literature on whether intraoral scanning is capable of reducing working time, the results compared to conventional impression procedures, its advantages and disadvantages, as well as its use in other areas of dentistry.

### Materials and Methods

Articles on the subject published through the PubMed, SCOPUS, and Google Scholar databases were analyzed, with emphasis on the last 5 years. The quality of the articles was evaluated using the PRISMA guide, i.e., identification, review, selection, and inclusion. The quality of reviews was assessed using the Measurement Tool for Assessing Systematic Reviews (AMSTAR-2). The implementation of the search using the AND, OR, AND NOT operators. Within the keywords used for “scan”, “time”, “impression”, “digital”, and “conventional”. The keywords were used individually, as well as each one of them related to the other.

### Results

#### Working time

Intraoral scanning is an alternative to conventional impressions, since it allows prior visualization of the area of interest, in addition to reducing working time and improving patient results <sup>[11]</sup>. According to a systematic review that was carried out in 2021, a clear trend was observed toward a shorter time for intraoral scanning compared to conventional impressions, regardless of the size of the scanned area<sup>4</sup>. It was shown that the experience of the operator is important in working time, operators with less time experience required longer times <sup>[12]</sup>. In a study carried out in 2016, he mentions that for unilateral impressions made by experienced clinicians, the shortest working time was achieved with the conventional impression with silicone, and with respect to the working time without powdering, the differences between conventional impressions and digital were not statistically significant <sup>[13]</sup>. Another 2015 clinical study comparing the efficacy of digital and conventional impressions for tooth-supported restorations found that digital quadrant impressions consume significantly less time than conventional full-arch impressions <sup>[14]</sup>.

Various studies carried out mention that an intraoral scan is faster and more accurate compared to a conventional impression, although the use of anthropologist models cannot be left aside since it allows us to see certain movements in the articulator that we do not. They are capable of being displayed on the computer.

#### Precision of intraoral scanners in dentistry

The precision of the impression methods is crucial for the internal and external fit of the final restoration. Tooth preparation and surface parameters do affect precision <sup>[15]</sup>. Other aspects considered are the resolution of the scanning system and the precision of the algorithm. Compared to the conventional technique, the digital method allows improvements or modifications of the scan by selecting some poorly scanned sections <sup>[16]</sup>. One of the aspects that must be considered for the precision in digital impressions is the resolution, a high resolution would allow a superior finishing line precision to minimize the marginal discrepancy between the preparation and the restoration. Clinically, using the high-

resolution feature requires additional chair time and can disrupt provider workflow <sup>[10]</sup>. According to the study carried out in 2020, no significant differences were observed between the default resolution and the high resolution in terms of precision in the finishing line of the cavo surface of the crown preparation with the 3Shape TRIOS 3 intraoral scanner <sup>[6]</sup> in 2013, reported that the accuracy of intraoral data acquisition and conventional impressions is the same <sup>[17]</sup>. On the contrary, in 2016, they reported that intraoral scanners were more accurate than the conventional method <sup>[18]</sup>.

The intraoral scanner is not exempt from presenting discrepancies in the digitized models, as with an impression and a conventional model, it is likely that the scanner will not allow us to obtain a good finishing line if it is very subgingival or very small, as well. However, the pixel capacity of each scanner is not the main factor for obtaining an error in the digital model. Despite this, the scanner can often provide us with a great digital model that obtains good precision and avoids modifications, either by the movement of the patient or the tearing of the conventional impression at the time of its removal.

#### Advantages and misfortunes of digital and conventional impressions

Studies on conventional impressions in the laboratory environment often report greater imposition due to the blood and the patient's movement increasing the imprecise rate. These factors also affect the accuracy of impressions taken with the use of intraoral scanners. However, digital systems allow the expansion of scanned teeth on the monitor and allow badly scanned areas. Thus, possible errors in impressions can be minimized. This can explain the small differences in the precision of digital and conventional techniques <sup>[10]</sup>. One of the limitations of the conventional technique in the intake of impressions is the changes in dimensions and the deformity, the spaces between the internal surface of the structure. The type of bucket used can affect the quality and accuracy of impressions <sup>[3]</sup>. In studies, we observe that the use of digital impressions provides greater comfort for patients since they help us avoid a reflection of nausea when it takes impressions, unlike the conventional form <sup>[19]</sup>. Printing favors maximizing the efficiency of our work times when performing a restorative treatment, that is, the greatest advantage in laboratory work efficiency, since in terms of time at the time of taking the impression so much Digital as conventional is very similar <sup>[20]</sup>. A very important problem to consider is that the light of the scanner does not allow us Difference in the conventional way <sup>[21]</sup>. A very important factor to consider in the clinical field is that it is very important to use the same equipment throughout the treatment since it can affect the use of different iOS during the same treatment <sup>[22]</sup>. Another advantage that we can find is the use of a scanner in other specialties such as orthodontics since the main problem for printing in patients with orthodontic simply tearing the impression when removing it, at the time of us using a scanner this is avoided and in the same way, it helps the patient's comfort and practicality to take the impression <sup>[19]</sup>.

The intraoral scanner can give us a patient model in a simpler way and also gives the patient more comfortable when not placing a material in the mouth as alginate that can cause nausea. Any of the two ways to obtain a study model can cause errors in the models, however, the scanner allows us to make an almost instantaneous modification.

## The use of digital impressions in the different branches of dentistry

The use of the intraoral scanner opens the doors to the use of digital and mechanized technology to facilitate the carrying out of a restorative treatment and in the same way to obtain success more precisely as it is planned. Some tool that the scanner helps us with is to obtain a digital waxing, which can be shown to the patient and consider the patient's opinion to be able to have a design appropriate to their needs<sup>[23]</sup>. The use of digital technology to design waxes for treatments with which a Mock-up is used allows us dentistry in which we can take advantage of the scanner to perform surgical guides. With the use of digital impressions, it is faster than the option of the model and planning<sup>[25]</sup>. One of the advantages of these is the visualization and evaluation of the dental plate since these devices use several color images which allows an evaluation of the plate control registration, while a new strategy is at the same time to educate patients about dental hygiene<sup>[26]</sup>. One of the most provinces of pathologies today is dental wear, therefore, early diagnosis is important. In studies carried out, the intraoral scanner was evaluated to quantify the progression of dental wear. They observed that the sensitivity levels of the intraoral scanner to detect intraoral wear were higher than the specificity levels<sup>[27]</sup>. Another area in which digital impressions can be used is in orthodontics, which allows us to have a panorama Prior to the movements that can be performed to obtain a successful treatment by placing bracket points in the digital model and having better planning of orthodontic treatments, they also allow us to have width and length measurements of the arc, tooth size, dimensions Transversal, a discrepancy of Bolton, highlights and over - over, which are obtained with notable precision and efficiency<sup>[28]</sup>.

The use of digital flow in the different branches of dentistry is of great advantage since apart from its speed, it allows us to have a future visualization and a record of the before and after each treatment, being a great tool for the diagnosis and for proper planning.

### Conclusion

A chapter meaning in evolution in dentistry is intraoral scanners, having a promising future ahead. Digital impressions have contributed innovation to impressions and have partially set aside conventional methods (alginate and siloxane polyvinyl). Intraoral scanners offer significant windows, such as the effectiveness of time, patient comfort, simplification of clinical procedures, and storing and capturing information that can be used over time. They are also easy to diagnose and treatment planning. Among the disadvantages of the use of this are the high cost and the existence of a learning curve for the use of intraoral scans.

### Conflict of Interest

Not available

### Financial Support

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