Dental impression techniques assessment: patients' rating and perceptions

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Abstract. Dental impression in dentistry is used for many purposes. One of these is to make a model that allows the study of fine details outside the oral cavity, which is sometimes impossible to achieve by direct prosthetic field inspection. Purpose: Through the study, we aim to highlight the importance of the patient’s understanding and availability of the prosthetic field impression techniques. Material and method: The study lot consisted of 54 patients who formed the data base processed throughout the research, men and women aged 35 to 50 with a partial or total edentation. Conventional impression for mandibular and maxillary jaw were taken with a polyether type material (Impregum, 3 M ESPE) and addition silicones (Express STD Putty Regular Set 3M), and digital impression was done with the AC Omnicam chairside system (Cerec OMNICAM, Sirona Dental GmBH). Interpretation of results was performed using statistical programs SPSS 15.0 and Wilcoxon Signed-Rank Test, with p = 0.05 as the minimum statistical reference value. Patient preference for impression technique was evaluated with a comparative questionnaire of 5 questions, the results being interpreted with SPSS 15.0. Conclusions: Following the study, digital impression offers increased patient comfort for many reasons. The small size of the intraoral scanner eliminates the inconvenience of holding a voluminous, material-loaded portrait that generates the feeling of vomiting in many patients. At the same time, several patients may experience allergic reactions of impression materials, a situation that does not occur using digital technology. There is also a risk of swallowing the impression material in the event of improper handling.

1. Introduction
Impression in dentistry is an essential stage in the development of dental (orthodontic) appliances, fixed prostheses (dental crowns, crowns on implants, dental bridges) or mobile and mobilizable ones [1-4]. Impressions have been developed and improved over time, from the classic gypsum, Stents, following synthesis alginites and elastomers [5-7]. At present, most dentists use synthetic elastomers (polyether, polixiloxanes) that have an excellent degree of stability and fidelity, accurately depicting the most complex preparations and prosthetic fields [8-12]. Despite the impeccable quality of modern
fingerprint materials, they remain inconvenient during the imprinting phase, which can ultimately jeopardize the quality of prosthetic restorations and their adaptation to the prosthetic field of the patient. Considering the stunning progress of technology, it is inevitably also felt in the field of dentistry [13-15]. Digital impression is still a little known and applied in our country, especially because of the significantly higher costs that occur at the end of the treatment. But certainly, the direct connection with the already-known concepts of Digital Smile Design and CAD-CAM will determine the application of this technique on a much wider scale, at which time the costs will be reduced.

Purpose: Through the study, we aim to highlight the importance of the patient's understanding and availability of the prosthetic field impression techniques [16-18].

2. Materials and methods
A clinical trial was conducted with patients who presented themselves in the Faculty of Dental Medicine of Iasi. Inclusion criteria: patients who had total or partial edentation and who had no prior experience with dental impressions. The study lot consisted of 54 patients who formed the data base processed throughout the research, men and women aged 35 to 50 with a partial or total edentation. Conventional dental impressions were recorded with a polyether material (Impregum, 3 M ESPE) and addition silicones (Express STD Putty Regular Set 3M), and digital impression with the AC Omnicam (Cerec OMNICAM, Sirona). After recording the impressions, study patterns were compared for the determinations performed, and patients were questioned about their attitude, comparatively, for the two types of techniques, conventional and digital impression technique were evaluated using a standardized questionnaire of 5 questions. The comparison between the degree of fidelity of the models made, depending on the material used, was made using Wilcoxon statistical tests, with $p = 0.05$ as the level for statistical significance. The attitudes and perceptions of the subjects on both impression techniques were assessed with a self-administered questionnaire using a Visual Analog Scale (VAS) ranging from 0 to 100. The data were analyzed statistical by the Wilcoxon Signed-Rank Test, with $p = 0.05$ as the level for statistical significance.

3. Results and discussions
The evaluation of the effectiveness and clinical outcomes for both impression techniques are presented in Table 1. Statistically significant differences were found regarding the mean overall treatment times ($p < 0.001$), and the mean impression ($p < 0.001$). The difference between the mean occlusion registration time for the conventional technique and the mean occlusion scan time for the digital technique was statistically significant ($p < 0.001$).

| Efficiency                  | Conventional | Digital     | P-value  |
|-----------------------------|--------------|-------------|----------|
| Tray selection/Patient info | 15.11 ± 1.41 | 20.12 ± 2.33| >0.05    |
| Maxillary impression/maxillary scan | 228.43 ± 18.18 | 115.62 ± 15.72 | <0.001*  |
| Mandibular impression/Mandibular scan | 198.16 ± 9.9 | 77.23 ± 8.23 | <0.001*  |
| Occlusion registration/occlusion scan | 85.47 ± 9.55 | 43.11 ± 1.62 | <0.001*  |
| Total time for treatment    | 584.74 ± 21.44 | 296.34 ± 20.01 | <0.001*  |
The evaluation of the Scores of prosthetic field fidelity by material is presented in Table 2, and as we can see. Statistically significant differences were found by comparing polyether with addition silicones materials and digital impression (p-value <0.001).

| Prosthetic field fidelity by material | polyether IMP | addition silicones IMP | digital IMP | P-value |
|-------------------------------------|---------------|-------------------------|-------------|---------|
| Partial edentation                   | 60,76 ± 19,9  | 50,13 ± 14,4            | 77,96 ± 9,9 | <0.001* |
| Total edentation                     | 65,42 ± 12,5  | 45,92 ± 18,5            | 71,12 ± 15, | <0.001* |

To evaluate whether the degree of fidelity of the fingerprint field shows statistically significant differences, we compared by comparison the materials used, namely polyether with addition silicones, polyether with digital method and digital method with addition silicones, using Wilcoxon Signed-Rank Test (Table 3 -5).

**Table 3.** Fidelity comparative values for polyether and addition silicones.

|                          | N  | Mean Rank | Sum of Ranks |
|--------------------------|----|-----------|--------------|
| Polyether / addition silicones | 25 | 24.00     | 620.00       |
| Polyether addition silicones | 25 | 39.50     | 1320.00      |
| Total                    | 50 |           |              |
| Mann-Whitney U           | 15,000       |           |              |
| Wilcoxon W               | 620,000      |           |              |
| Z                        | -5.778       |           |              |
| Asymp. Sig. (2-tailed)   | .000         |           |              |

**Table 4.** Fidelity comparative values for addition silicones and digital method.

|                        | N  | Mean Rank | Sum of Ranks |
|------------------------|----|-----------|--------------|
| addition silicones / digital method | 25 | 55.00     | 778.50       |
| addition silicones     | 25 | 64.5      | 2567.50      |
| digital method         | 25 |           |              |
| Total                  | 50 |           |              |
| Mann-Whitney U         | 567.500      |           |              |
| Wilcoxon W             | 2567.500     |           |              |
| Z                      | -5.224       |           |              |
| Asymp. Sig. (2-tailed) | .000         |           |              |

In Table 3 – Table 5, we can see that the values indicate the significance level of this test. The Z scores are -5.778, -5.224 and -5.004, and have a two-tailed probability of 0.0001. This means that the differences between the materials tested are statistically significant, also indicates the Mann-Whitney base statistics, the U value for each pair of materials being 15.00, 567.500, and 470.000, which is statistically significant, p = 0.0001 <0.05.
Table 5. Fidelity comparative values for polyether and digital method.

| Polyether / digital method              | N | Mean Rank | Sum of Ranks |
|----------------------------------------|---|-----------|--------------|
| Polyether                              | 25| 18.00     | 470.00       |
| Digital method                         | 25| 45.5      | 2456.00      |
| Total                                  | 50|           |              |

Mann-Whitney U: 18.000
Wilcoxon W: 470.000
Z: -5.004
Asymp. Sig. (2-tailed): .000

The evaluation scores and the level of concerns of the subjects regarding the impression techniques are presented in Table 6. The mean scores of the subjects’ evaluation criteria regarding the two impression techniques were significantly different (p < 0.001). The mean scores were not statistically significant (p > 0.05).

Table 6. Participants’ evaluation scores and level of self-concerns about impression techniques.

| Evaluation (VAS score) | Conventional | Digital | P-value |
|------------------------|--------------|---------|---------|
| General discomfort     | 53,00 ± 28,55| 84,07 ± 15,88 | <0.001* |
| Total time             | 54,74 ± 52,87| 88,73 ± 19,21 | <0.001* |
| General discomfort     | 51,21 ± 40,93| 85,76 ± 18,23 | <0.001* |
| General technique difficulty during procedure | 61,25 ± 28,93 | 75,45 ± 22,56 | <0.001* |
| Teeth payn after the impression | 44,46 ± 36,29 | 84,32 ± 21,62 | <0.001* |
| Total evaluation score | 499,31 ± 255,44 | 856,11 ± 157,11 | <0.001* |

Table 7. Participants’ preferences according to the 5-item questionnaire.

| Preferences | Conventional | Digital |
|-------------|--------------|---------|
| Which impression technique was more preferable? | %24 | %76 |
| Which impression technique is less painful? | %11 | %89 |
| Which impression technique you would suggest to your relatives? | %7 | %93 |
| Which impression technique it was faster and more comfortable? | %14 | %86 |
Most patients preferred the digital impression technique (p<0.001), and patients’ preferences regarding the impression techniques, according to the 5-item comparative questionnaire, are listed in Table 7.

In this study, both the patient's satisfaction degree and the fidelity of the prosthetic field according to the materials used. A majority for the digital impression technique was observed, and in terms of fidelity, the digital impression was also the one with the best score of the methods used. comparing the polyether with the addition silicones, a better score of the prosthetic field fidelity for polyether was observed. In a similar study comparing the efficiency and comfort of the patient in the two dental impression techniques (conventional and digital). It is concluded that the total treatment time using the conventional impression technique is longer than digital impression technique, being one of the factors that led 100 % of the subjects to prefer digital technique [19].

4. Conclusions
According to the study, we can assume that the digital dental impression is superior to the conventional one for the speed of recording, for the comfort of the patient and the doctor, but we cannot conclude that the digital method is superior to the conventional method in terms of fidelity, accuracy or reproduction of prosthetic field details.

Due to the accuracy, reduced duration, patient comfort and finally due to reduced material consumption, intraoral scanning has gained increasing popularity and is expected to gradually replace the classic impression.

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