Traditional versus digital impression: compliance and preference in pediatric patients- review

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Abstract

The purpose of this article is to compare the alginate impression with digital impression using the introral scanner Carestream 3600 and understand which is preferred by patients. 50 young orthodontic patients (25 boys and 25 girls) who had no previous experience of impressions were enrolled in the study. After the impressions the patients were subjected to a questionnaire for both types of impressions. They were asked about feelings of nausea and breathing issues related to whether a digital or alginate impression was taken. As for the feeling of nausea, 24 girls and 22 boys did not have this feeling with digital impressions; as regards breathing, 19 girls and 23 boys did not find respiratory problems with the intraoral scanner. At the end, patients were asked which method they preferred. About 75% both for girls and boys preferred the intraoral scanner. Therefore, the digital method was found to be the most comfortable for the patients.

Key words: children, digital impression, alginate impressions, patient comfort, patients' preferences, orthodontics patient, feeling of nausea, problems in breathing.

Introduction

Nowadays with the advancement of progress and technology, dentistry is increasingly facing, embracing all its branches to the third dimension [1]. The traditional impression is an unwelcome phase both for adult patients and children, for whom it represents a moment of discomfort. It can also be complex for the clinician. The possibility of effectively replacing the traditional physical detection of the impression represents the main advantage of the optical impression. In orthodontics this has a fundamental importance both from a clinical and diagnostic point of view. Traditional orthodontic study models have also been replaced by digital study models, through which the orthodontist can perform all the measurements he or she made on the plaster model [2]. In orthodontics, a first attention was paid to the first scanners capable of transforming plaster models into 3D images, but with the appearance on the market of intraoral scanners, there was a real revolution [3]. In the most recent literature there are many studies that focus on the main features of intraoral scanners, such as the accuracy and precision of measurements, but very few or almost non-existent studies evaluate the patient's compliance. For this reason, through this research we want to understand which method is most appreciated for taking impressions in the field in the pediatric orthodontic field.

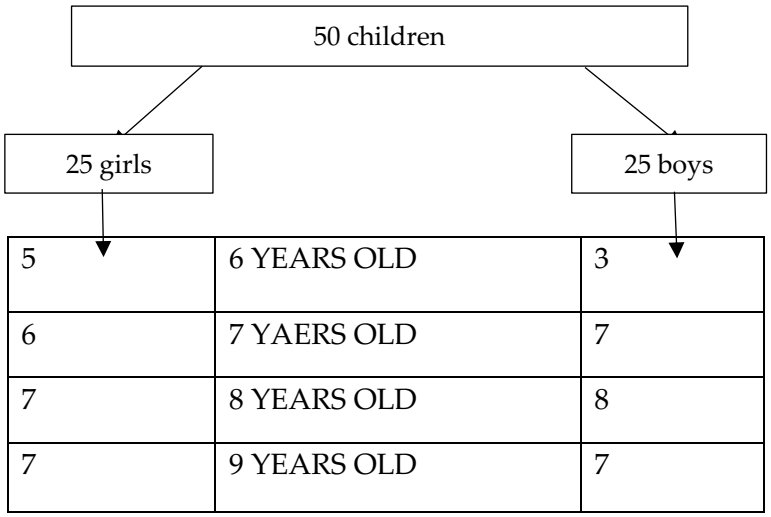
Materials and methods

50 pediatric patients, 25 females and 25 males with an age between 6 and 9 years (Table 1), who made the first dental visit at the Department of Pediatric Dentistry of the La Sapienza University. The parents of the young patients were informed about the purposes of the research and signed informed consent. In order to be included in the study, patients had to meet two requirements to participate in the study:

- They never had impressions procedures before the study;
- Make an impression to have study models for orthodontic purposes.

Each of them was first subjected to impression taking with alginate and occlusion wax, sent to the technician to be able to develop the plaster models and later with the CareStream 3600 intraoral scanner, thus obtaining 50 plaster models and 50 corresponding digital models. Each patient was administered an illustrated questionnaire, before and after taking the impression. It contained three questions, made more pleasant in the eyes of the children by the replacement of the boxes where to place the X with three smiley, happy, sad or indifferent faces (Table 2). The outcomes that have been chosen were studied through an assessment of the sense of nausea, ease of breathing and any other problems related to the two techniques. Only in the final analysis

Table 1. Breakdown of patients by age.



5	6 YEARS OLD	3
6	7 YAERS OLD	7
7	8 YEARS OLD	8
7	9 YEARS OLD	7

Table 2. Satisfaction questionaire submitted to each patient.

SATISFACTION QUESTIONNAIRE IMPRESSION

DURING THE IMPRESSION WITH CAMERA

- DID YOU COME TO THROW UP?

- COULD YOU BREATHE QUIETLY?

- I HAVEN'T ANY PROBLEMS

DURING THE IMPRESSION WITH PONGO

- DID YOU COME TO THROW UP?

- COULD YOU BREATHE QUIETLY?

- I HAVEN'T ANY PROBLEMS

WHICH METHOD DO YOU PREFER?

- CAMERA ☐
- GEL ☐
- NO PREFERENCE ☐

was the participant asked to express a preference for one or the other method. The language that was used in the questionnaires is a simple jargon easily understood by the young patients. The word “pongo” was used instead of alginate and the word “camera” instead of scanner. All procedures were carried out by an operator and over a period of a month.

Results

As graph one shows, through which the responses concerning the feeling of nausea were analyzed, 24 girls replied that they had no sensation, while only one girl gave a “short” answer regarding the taking of impressions with the scanner. While, for conventional impressions, 6 girls had to vomit, for 10 the experience was uncertain and at last 9 girls had no vomiting reflex (Figure 1)
In the second graph, the answers from female patients to the second question of the questionnaire were analyzed regarding the possibility of having difficulties in breathing. Regarding the impression with the scanner, 19 girls answered that they had no breathing problems, while 6 in an uncertain manner. The data vary by analyzing the response with the conventional method. Only 10 girls replied that they could breathe quietly, 8 were uncertain and 7 had problems with breathing (Figure 2).
In graph number 3, the answers of the female patients to the third question regarding the possibility of having had other problems were analyzed. Regarding fingerprints for 18 girls there was no problem. Two answered had problems and the remaining 5 answers are uncertain.
Regarding the conventional method, it can be observed that an equal number of girls responded in the affirmative and neutral way, while 3 of them have definitely encountered problems (Figure 3).
The responses of the children were assessed and in chart 4. The feeling of nausea was analyzed from the scanner - 22 children had no problems, 3 remained neutral and no child gave an affirmative answer.
On the contrary, during taking the alginate impressions, only 5 children did not have the vomiting reflex, 9 perceived it and finally 11 remained neutral (Figure 4).

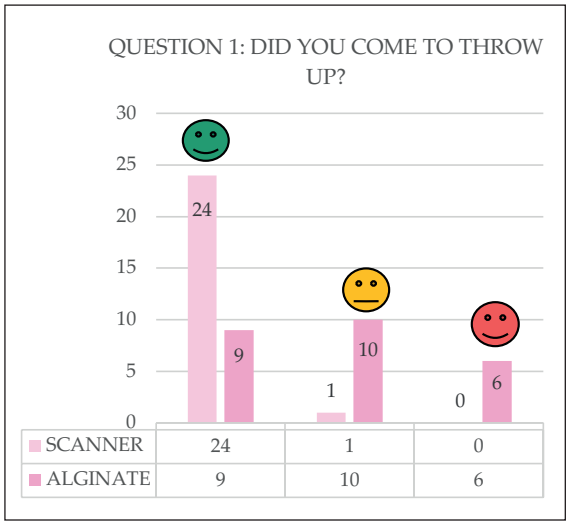


Figure 1. Feeling of nausea in girls.

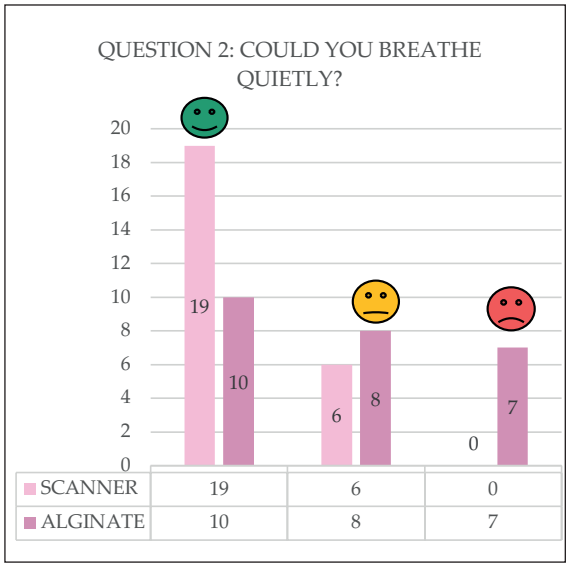


Figure 2. Breathing pproblems in girls.

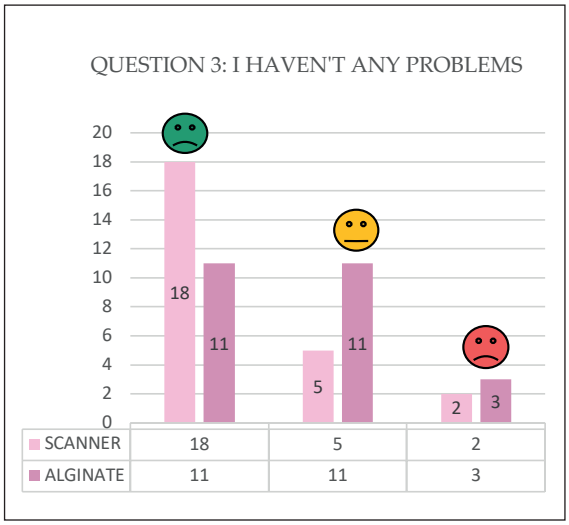


Figure 3. Others problems in girls.

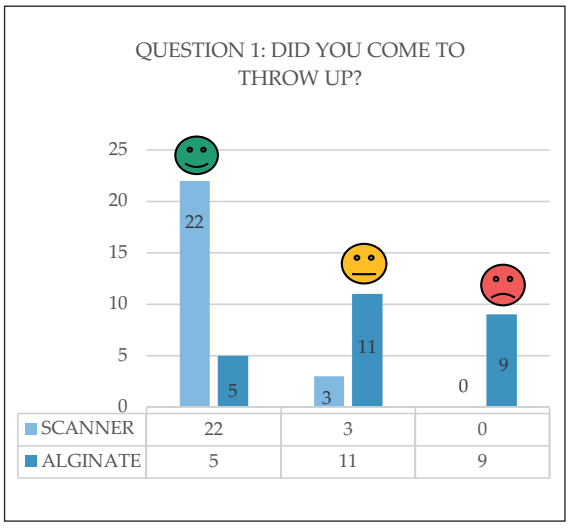


Figure 4. Feeling of nausea in boys.

In graph 5 the answers to question number 2 were analyzed, which concerned the possibility of breathing peacefully. While using the digital method, 23 children were able to breathe quietly, 2 responded uncertainly while no negative response was obtained. While using the alginate, on the other hand, 9 children responded in an affirmative way, 4 in a negative way and most, that is, 12 children, responded in an uncertain / hesitant manne (Figure 5).
Finally, in chart number 6, the answers to the question on the possibility of having had other problems were analyzed. During the impression with the scanner, there were no problems for 20 children and five answered hesitantly. With the alginate impression, 5 children replied that they had problems, 12 replied hesitantly while for 8 of them experienced no problem (Figure 6).
The last questionnaire that was completed asked the children to express a preference for one or the other method. From chart ° 7 for boys and ° 8 for girls it can be highlighted how in equal percentage (75%), in both sexes, the scanner is preferred. Alginate is the preferred method to a greater extent by boys (20%) than girls who choose this option (12%). At last, 5% of boys and 12% of girls do not prefer any of the two methods (Figure 7).

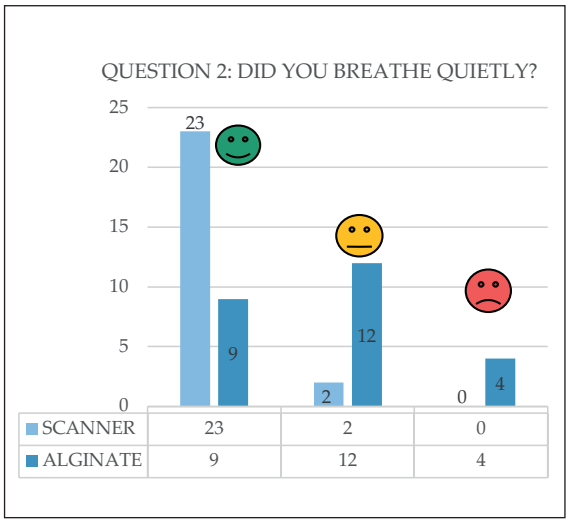


Figure 5. Breathing problems in boys.

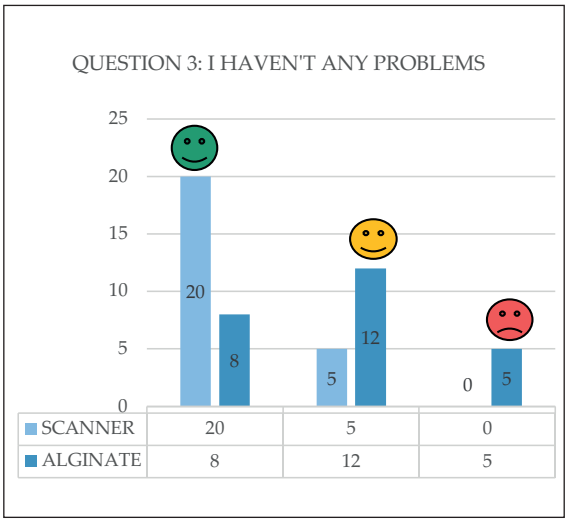


Figure 6. Other problems in boys.

Discussion

Study models, therefore, represent an essential form of orthodontic documentation for documentation and analysis of the case. With the advent of digital impression, many of the limits that were had with conventional impression were overcome. They are not subject to physical damage, do not create dust or other disorders and require negligible storage space. The digital information can be stored on the computer's hard drive, on storage devices such as CDs or on a central server. Recovery is fast and efficient because the models are stored by the patient's name and number. They also make it possible to reduce time and expense of duplicating the models to be transferred to colleagues or laboratories and, at last, they are an excellent case presentation tool [5]. But digital models also have disadvantages. The high initial cost to which is added the cost of constant technologi-

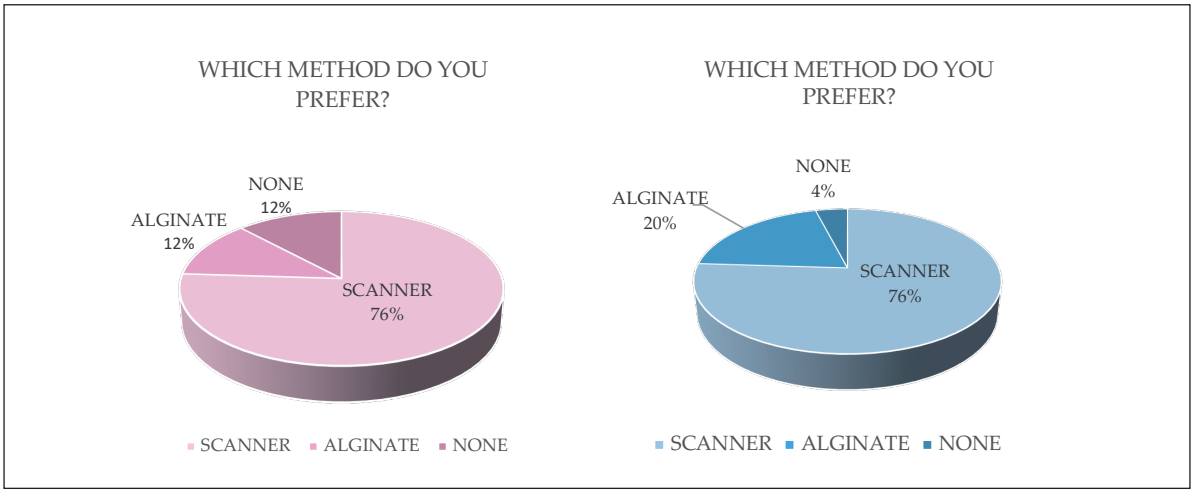


Figure 7. Preference of boys and girls.

cal updating. There learning time that the clinician needs to effectively master the system and familiarize with the hardware and software. Some patients are more difficult to manage, for example the inability to hold their tongue still or to remain motionless with mouth open. Finally it is difficult to scan very pronounced emergence profiles, interproximal areas with severe misalignment, upper retromolar areas in proximity to the coronoid process and data overlap of the antero-superior palate-occluded-vestibular sector [6].

According to the numerous advantages of digital impressions, there are some studies in the literature which show, like our study, that young patients prefer these.

In a 2014 study conducted by Yuzbasioglu E. et al the traditional impression was compared with the digital impression to understand what was preferred by the patients. 24 young patients, 12 male and 12 female, who had never taken the impression neither in alginate nor digitally, were examined. After taking the impressions the patients' preferences, their perceptions and working times were assessed through a questionnaire. Statistical analyzes were performed using the Wilcoxon Rank test and P <0.05 was considered positive. The results showed significant differences between the groups in terms of total working time and processing phases, but patients still preferred the digital technique over the conventional one in terms of comfort [7].

In a 2015 study by Lukasz B. et al, the alginate impression technique was compared with two digital techniques and the preference was assessed in young orthodontic patients. Thirty-eight subjects aged 10 to 17 years requiring impressions for orthodontic treatment were randomly allocated to 3 groups that differed in the order that an alginate impressions and 2 different intraoral scanning procedures were administered. After each procedure, patients were asked to evaluate their perceptions on a 5-point Likert scale for reflex of vomiting, nausea, difficulty breathing, feeling of discomfort, perception of scan time, anxiety and the use of a powder , and select the preferred impression system. The presidential time and maximum mouth opening were also recorded. During the alginate impression taking in the upper arch, greater nausea (P = 0.00) and discomfort (P = 0.02) were perceived compared to scans with CEREC Omnicam (Sirona Dental Systems, Bensheim, Germany); while there were no significant differences in perceptions between the impression taking in alginate and the Lava C.O.S. (3M ESPE, St Paul, Minn) and between the 2 scanners. 51% of subjects preferred digital impressions, while 29% preferred alginate ones and 20% expressed no preference. Therefore, it was possible to conclude that young orthodontic patients prefer digital techniques over alginate impressions, although these require less time in the chair [8].

Burzynskia J. A. et al in 2017 conducted an initial pilot study through which a valid and reliable survey tool was created that can measure 3 areas of patient satisfaction for taking the impression. A visual analog scale survey was developed and administered to 180 orthodontic patients receiving 1 of 3 types of impressions:

- iTero Element intraoral scan (Align Technologies, San Jose, Calif), n = 60;
- TRIOS Color intraoral scan (3Shape, Copenhagen, Denmark), n = 60;

Conventional alginate impression (imprEssix Color Change; Dentsply Sirona, York, Pa), n = 60.

and the time required to obtain the impressions was recorded. Data indicated that subjects receiving intraoral scans preferred digital impression and that subjects receiving alginate impressions were neutral, while efficiency varied based on the impression method. The authors eventually concluded that intraoral scanners are accepted by orthodontic patients and have an efficiency comparable with conventional impression methods depending on the type of scanner [9].

In 2018 a study conducted by Mangano A. et al examined 30 young orthodontic patients (15 male and 15 female) who had never had experience with the impressions. Conventional impressions for orthodontic study models were taken using an in alginate and fifteen days later, the impressions were taken, using an intraoral scanner (CS3600®, Carestream Dental, Rochester, NY, USA). Immediately after taking the impression, the acceptability, comfort and stress of the patients were measured using two questionnaires and the State-Trait Anxiety Inventory. The data showed no difference in terms of anxiety and stress; however, patients preferred the use of digital systems rather than conventional impression techniques [10].

In a 2019 study conducted by Ylmaz H. et al the fingerprints were compared with alginate and digital ones, assessing the comfort, preference and time required to make the impression. 28 children were assessed and comfort was examined by both patients and the clinician during the impression taking; the necessary chair times were also assessed. For statistical analysis, the t test and Mann-Whitney U test were used and P <.05 was considered significant. In terms of comfort, digital impression were the ones most preferred by children, while in terms of time, no significant differences were found between digital and alginate impressions [11].

Despite this literature supporting the purpose of this review, the study has some limitations. In fact, only one type of intraoral scanner was used, so other intraoral scanners with their workflows could lead to different results. In addition, the two types of impressions were taken by a single operator, to avoid errors between different operators.

Conclusions

The following study showed that young orthodontic patients prefer digital impressions, although alginate impressions required the shortest chairside time. These results is also confirmed by the literature review not only in terms of patient comfort, but also for all the advantages of intraoral scanners. More well-designed research is needed in the future to increase our knowledge of patients' experiences with digital impressions.

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