Evaluation of Perception on Intra-Oral Scanning and Alginate Impression among Orthodontic Patients in Chennai

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Abstract

Background: Most of the treatment modalities in dentistry are based on obtaining study models. The study models are of two types, namely, conventional study models made of gypsum products and digital models

Aim: To evaluate patient's perception on intra-oral scanning and alginate impression in Chennai population.

Methodology: 20 subjects were selected from the Department of Orthodontics, Saveetha Dental College and Hospital, Chennai. Conventional impression was made using alginate and intra-oral scanning was done for the same patient after 5 days. The patients were asked to fill a questionnaire comprising of 12 questions.

Results: Majority of the participants reported that alginate impression had more gag reflex and made the mouth dry. Participants preferred alginate impressions in terms of maximum mouth opening. The overall discomfort was equal for both techniques. Intra-oral scanning consumed more time than alginate impressions. Thus the overall preference rate was equal for both intra-oral scan and alginate impression.

Conclusion: Orthodontic patients in Chennai reported equal preference for intra-oral scan and alginate impression.

Keywords- *Intra-oral scan, alginate impression, conventional impression, patient perception, digital scan*

Introduction

Most of the treatment modalities in dentistry are based on obtaining study models. Study models are the accurate replica of the intraoral structures of the patient that helps in diagnosis and treatment planning even in the absence of the patients. These study models are of two types, namely, conventional study models made of gypsum products and digital models. Conventional study models are obtained by making impressions of the dental arch using various impression materials. The digital models are obtained by either directly or indirectly. Indirect method is by laser or cone-beam computed tomography scanning of plaster models or alginate impressions. Direct method is by scanning the dentition with an intra-oral scanner.[3,5,12-14]

Computer-aided design and manufacturing (CAD-CAM) system, was introduced in the field of orthodontics in the 1990s[1].Even though it was introduced earlier, its use is being gradually increasing only in the recent times for diagnosis, treatment-planning and documentation of treatment results.[13,15-17] The first digital intraoral scanner was introduced by Mormann and Brandestini in the 1980s, and was further developed as a powerful tool for Chairside Economical Restoration of Esthetic Ceramics (CEREC).[2,19,20]

Intra-oral scanning has many advantages over conventional study models from a clinician's perspective. The advantages are that the time required for pouring the cast is minimised, reduced physical storage space, no chances of wear of the models, and no changes

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with respect to variations in environmental factors [1,4,18,11]. Moreover, scanned images make it easier for the clinicians to communicate the case with their fellow colleagues or technicians.[1,4] Treatment planning and Kesling's set up has become less time consuming with the use of virtual models. Literature reviews report that the measurements made in the intra-oral scanned images and conventional study models are clinically reliable and valid.[2,3]

Even though the clinicians find this new technology advantageous, the advantages from patient's perspective are questionable. Patient's perception on intra-oral scanning can vary among different population, as the attitude or mentality of the people depends on their nature of living and cultural diversity. Therefore, the present study was aimed to evaluate the perception on intra-oral scanning and alginate impression among the orthodontic patients in Chennai.

Material and Methodology

Patient selection

20 subjects (9 males and 11 females) were selected for the study from our department.

Inclusion criteria

- Age group- 15 to 30 years
- Patients with no previous experience on impression making.
- Orthodontic patients before the start of the orthodontic treatment.

Exclusion criteria

- Patients with restricted mouth opening.
- Patient with deep carious lesions.
- Patients with active periodontal disease.
- Patients with temporomandibular disorders.

Study design

Alginate impression making

Maxillary and mandibular tray of appropriate size was selected. Patient was explained about the procedure. Alginate was mixed according to the manufacturer's instructions and the impression was made. Care was taken not to overload the tray with alginate in order to prevent gag reflex. Impressions were made by well experienced clinician, so that good orthodontic diagnostic impressions were made in a single attempt without the need to repeat the impressions.

Intra-oral scanning

Intra-oral scanning was done after 5 days of making alginate impression. Before starting the intra-oral scanning, the procedure was explained to the patient. Intra-oral scanning was done by an experienced clinician using Trios, 3Shape intra-oral scanner. After the completion of the scan, a questionnaire comprising of 12 questions were given to the patient.

Questionnaire

The questionnaire comprised of 12 questions were given as print outs. The questionnaire was designed in such a way that it evaluated both the preference and perception of the patients on impression technique. 6 questions assessed the preference of the patient while 5 questions assessed the perception of gag reflex, pain, discomfort, time consumption etc. The perception and acceptability was assessed by a 5 unit rating scale, i.e., strongly disagree, disagree, neutral, agree and strongly agree. One of the questions was repeated to make sure that the patients fill the questionnaire after carefully reading the questions.

Statistical analysis

Statistical analysis was done using IBM SPSS Statistics Software Version 20.0 for Windows.

Results

Tables 1 and 2 represent the frequency percentage for the questions that assessed patient preference and perception respectively. It was observed that all the questions were answered by all the subjects.

Table 1: Frequency percentage for questions that assessed patient preference

Questions	Alginate impression (%)	Intra-oral scanning (%)
Which impression technique do you feel is comfortable?	55	45
Which impression technique do you feel has minimum gagging reflex?	0	100
Which impression technique has more breathing difficulty?	85	15
Which impression technique do you prefer in terms of maximum mouth opening?	65	35
Which impression technique do you think is more time consuming?	10	90
Which impression technique do you think has more gag reflex?	100	0
Which impression technique do you prefer/suggest in case of a friends' need for impression making?	50	50

Table 2: Frequency percentage for questions that assessed patient perception and acceptability

Questions	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
Intra-oral scanning is more comfortable than alginate impression.	15	30	55	0	0
Intra-oral scanning is a painless procedure compared to alginate impression.	10	30	60	0	0
Alginate impression has a burning sensation compared to intra-oral scanning.	5	10	30	50	5
Alginate impression makes your mouth dry compared to intra-oral scanning.	0	45	30	20	5
Intra-oral scanning is a less time consuming procedure than alginate impression	0	0	40	45	15

Discussion

The present study was targeted towards the young orthodontic patients in Chennai who had no previous experience with any type of impressions in order to prevent skewing of the data with any previous experience. Patients with restricted mouth opening, TMJ disorders, active periodontal disease and deep carious lesions were excluded since these factors can cause pain and discomfort while taking impressions or scanning and skew the result. Intra-oral scanning was done 5 days after taking alginate impression in order to reduce the chair side time for that particular day and continuously opening the mouth wide can lead to pain and discomfort.

The questionnaire comprised of questions to identify both preference and perception of the patients on alginate impression and intraoral scanning. 6 questions assessed the preference and 5 questions assessed perception. One of the questions was repeated to make sure the participants read the questions carefully before answering. It was noted that all the subjects responded correctly to the repeated question. The questions were focused on gag reflex, breathing difficulty, comfort, burning sensation, mouth dryness, and time consumption of both alginate impression and intra-oral scanning.

Results of the present study shows that patients who had more gag reflex while making alginate impressions preferred intra-oral scanning while those who did not have gag reflex while making alginate impressions preferred the conventional alginate impressions. Most of all the patients had the same opinion that intra-oral scanning was a more time consuming procedure than alginate impressions. Majority of the patients experienced dryness of the mouth after making alginate impressions. When maximum mouth opening was considered patients preferred alginate impression. This may be because patient had to open the wide while scanning the most distal aspects of the oral cavity. When the overall comfort and preference was assessed, both alginate impressions and intra-oral scanning were at the same level.

Studies by Burzynski et al[6], Burhadt et al[5], Mangano et al[7],Yuzbasioglu et al[8], Sfondrini et al[9], Vasudavan et al[10] reported that orthodontic patients preferred intra-oral scanning than conventional impression techniques. Burzynski et al[6] and Burhadt et al[5] also reported that the eventhough intra-oral scanning consumed more time than conventional impression techniques, patients preferred digital impressions. All the studies report that most of the patients experienced gag reflex during alginate impression. The overall dsicomfort level was the same for both the techniques. The results of the present study correlated with the results of the previous studies in terms of perception of the patient on alginate impressions and intra-oral scanning. Whereas, when preference was considered, the results of the present study differed from that of the previous studies. The participants of the present study had equal level of preference for both the techniques. Since the sample size of the present study was limited, future studies on the perception of intraoral scan and alginate impressions among orthodontic patients in Chennai, with a large sample size is required.

Conclusion

We found that the orthodontic patients in Chennai had equal preference for intra-oral scanning and alginate impression. As the intra-oral scanning technology continues to advance, the time consumed for the technique will decrease and the tip size will reduce. This might lead to greater acceptance of intra-oral scanning by the patients.

Ethical Clearance: The study was approved by the Institution Review Board, Saveetha Dental College and Hosiptals, Saveetha University, Chennai.

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References

1. Jacob HB, Wyatt GD, Buschang PH. Reliability and validity of intraoral and extraoral scanners. Progress in orthodontics. 2015 Dec 1;16(1):38.
2. TOMITA Y, UECHI J, KONNO M, SASAMOTO S, IIJIMA M, MIZOGUCHI I. Accuracy of digital models generated by conventional impression/ plaster-model methods and intraoral scanning. Dental materials journal. 2018 Apr 17:2017-8.
3. Kirschneck C, Kamuf B, Putsch C, Chhatwani S, Bizhang M, Danesh G. Conformity, reliability and validity of digital dental models created by clinical intraoral scanning and extraoral plaster model digitization workflows. Computers in biology and medicine. 2018 Sep 1;100:114-22.
4. Anusavice KJ, Shen C, Rawls HR. Phillips' science of dental materials. Elsevier Health Sciences; 2013.
5. Burhardt L, Livas C, Kerdijk W, van der Meer WJ, Ren Y. Treatment comfort, time perception, and

preference for conventional and digital impression techniques: A comparative study in young patients. American Journal of Orthodontics and Dentofacial Orthopedics. 2016 Aug 1;150(2):261-7.

6. Burzynski JA, Firestone AR, Beck FM, Fields HW, Deguchi T. Comparison of digital intraoral scanners and alginate impressions: Time and patient satisfaction. American Journal of Orthodontics and Dentofacial Orthopedics. 2018 Apr 1;153(4):534-41.
7. Mangano A, Beretta M, Luongo G, Mangano C, Mangano F. Suppl-1, M8: Conventional Vs Digital Impressions: Acceptability, Treatment Comfort and Stress Among Young Orthodontic Patients. The open dentistry journal. 2018;12:118.
8. Yuzbasioglu E, Kurt H, Turunc R, Bilir H. Comparison of digital and conventional impression techniques: evaluation of patients' perception, treatment comfort, effectiveness and clinical outcomes. BMC oral health. 2014 Dec;14(1):10.
9. Sfondrini MF, Gandini P, Malfatto M, Di Corato F, Trovati F, Scribante A. Computerized Casts for Orthodontic Purpose Using Powder-Free Intraoral Scanners: Accuracy, Execution Time, and Patient Feedback. BioMed research international. 2018;2018.
10. Vasudavan S, Sullivan SR, Sonis AL. Comparison of intraoral 3D scanning and conventional impressions for fabrication of orthodontic retainers. Journal of clinical orthodontics: JCO. 2010 Aug;44(8):495.
11. McGuinness NJ, Stephens CD. Storage of orthodontic study models in hospital units in the UK. British journal of orthodontics. 1992 Aug 1;19(3):227-32.
12. Jacob HB, Wyatt GD, Buschang PH. Reliability and validity of intraoral and extraoral scanners. Progress in orthodontics. 2015 Dec 1;16(1):38.
13. Lippold C, Kirschneck C, Schreiber K, Abukiress S, Tahvildari A, Moiseenko T, Danesh G. Methodological accuracy of digital and manual model analysis in orthodontics–A retrospective clinical study. Computers in biology and medicine. 2015 Jul 1;62:103-9.
14. Koretsi V, Kirschbauer C, Proff P, Kirschneck C. Reliability and intra-examiner agreement of orthodontic model analysis with a digital caliper on plaster and printed dental models. Clinical oral investigations. 2018 Dec 11:1-0.
15. Rheude B, Lionel Sadowsky P, Ferriera A, Jacobson A. An evaluation of the use of digital study models in orthodontic diagnosis and treatment planning. The Angle Orthodontist. 2005 May;75(3):300-4.
16. Grünheid T, McCarthy SD, Larson BE. Clinical use of a direct chairside oral scanner: an assessment of accuracy, time, and patient acceptance. American Journal of Orthodontics and Dentofacial Orthopedics. 2014 Nov 1;146(5):673-82.
17. Peluso MJ, Josell SD, Levine SW, Lorei BJ. Digital models: an introduction. InSeminars in Orthodontics 2004 Sep 1 (Vol. 10, No. 3, pp. 226-238). WB Saunders.
18. Sweeney WT, Taylor DF. Dimensional changes in dental stone and plaster. Journal of dental research. 1950 Dec;29(6):749-55.
19. Brandestini M, Moermann WH, inventors; Moermann Werner H, assignee. Method and apparatus for the three-dimensional registration and display of prepared teeth. United States patent US 4,837,732. 1989 Jun 6.
20. Otto T, Schneider D. Long-term clinical results of chairside Cerec CAD/CAM inlays and onlays: a case series. Int J Prosthodont. 2008 Jan 1;21(1): 53-9.