https://doi.org/10.48047/AFJBS.7.2.2025.11-14

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

"Impression Accuracy: Digital Innovation vs. Conventional Practice in Peshawar"

Ijaz Ahmad , Syed Sadam Hussain , Ajwa Riaz , wasif Shah, Najeeb Ullah Afridi, Muhammad Aftab

BS Dental Technology ,Iqra National University Swat campus
Email: Ijazahmad01082000@gmail.com
CORRESPONDING AUTHOR : Syed Sadam Hussain
BS Dental Technology ,Mphil (science of dental materials) Khyber Medical University Peshawar
Email:syedsadamhussain258@gmail.com
BS Dental Technology,Iqra National University Peshawar ,Email: ajwariaz8@gmail.com
BS Dental Technology ,Iqra National University Swat campus,Email: Wasifshah45203@gmail.com
BS Dental Technology ,Iqra National University Peshawar ,Email: najeebullahafridi5858@gmail.com
BS Dental Technology ,Iqra National University Swat campus,Email: amasaftab@gmail.com

Volume 7, Issue 2, Feb 2025

Received: 15 Nov 2024

Accepted: 05 Jan 2025

Published: 03 Feb 2025

doi:10.48047/AFJBS.7.2.2025.11-14

Abstract

There has been a dramatic shift away from the use of alginate and polyvinyl siloxane (PVS) in dental impression-making in favor of digital techniques brought about by technological advancements. This research looks at digital impressions against traditional methods in Peshawar, comparing their accuracy, patient happiness, and clinical efficiency. Fifty people, split evenly between those who preferred traditional and those who preferred digital impressions, participated in a cross-sectional poll that took place at five different dental offices. A visual analog scale was used to measure patient satisfaction, while a coordinate measuring machine was used to analyze linear and volumetric deviations. When compared to traditional methods, digital impressions showed considerably fewer variations ($p < 0.001$) and higher levels of patient satisfaction (VAS 9.2 vs. 7.1, $p < 0.001$). Another finding is that the occurrence of gag reflexes was lower with digital impressions (4% vs. 24%, $p = 0.02$). Overall, digital impressions are more comfortable for patients and more accurate than traditional ones, which is why they are becoming more popular despite concerns about cost and training.

Introduction

With the advent of digital technologies, the dental field has undergone a sea change, and impression-making processes have been significantly impacted. For many years, traditional imprints made with

polyvinyl siloxane (PVS) or alginate were considered the gold standard (1). The physical molds used in these methods are prone to distortions due to material properties or human error in handling (2). The use of intraoral scanners (IOS) to create precise 3D models in digital impressions, on the other hand, eliminates the need for physical impressions and may improve accuracy, efficiency, and patient comfort (3).

Restorative fit and durability are two clinical outcomes that are directly impacted by how accurately imprints are taken, which in turn affect the success of fixed dental prostheses (FDPs) (4). While studies all across the world have compared digital and traditional methods, there is a lack of information from places like Peshawar, where technology adoption is still in its early stages. Focusing on therapeutic outcomes, patient happiness, and professional preferences, this study compares digital impressions to traditional ones in Peshawar and finds that the former are more accurate.

Methodology

Study Design

1. Between the months of January and June of 2024, five different Peshawar dental clinics, both public and private, participated in this cross-sectional survey. Fifty participants, split evenly across the two groups, were enrolled in the study to get FDP impressions:
2. **Conventional Impression Group (n=25):** Impressions were made using PVS material and standard trays.
3. **Digital Impression Group (n=25):** Impressions were taken with the Trios 3Shape intraoral scanner.

Inclusion and Exclusion Criteria

Inclusion Criteria:
Patients aged 18–60 years.
Indications for single or multi-unit FDPs.
No significant oral or systemic conditions.
Exclusion Criteria:
Extensive dental malalignments.
History of hypersensitivity to impression materials.
Severe gag reflex preventing impression-making.

Procedure

1. Preparation: In order to maintain consistency across all patients, standardized tooth preparations were carried out.

2. Techniques

Conventional Impression: Alginate was blended and applied using conventional trays. As directed by the manufacturer, the impressions were allowed to set.

Digital Impression: IOS scans of the prepped teeth were taken to create digital impressions. If rescanning was needed, scans were inspected to ensure completeness.

3. Accuracy Evaluation: A coordinate measuring machine (CMM) was used to assess linear and volumetric deviations from master models (5) when analyzing impressions.

4. Evaluating Patient Satisfaction: A visual analog scale (VAS) ranging from 0 (very poor) to 10 (very good) was used (6).

5. Clinical Input: A systematic questionnaire was used to gather information from clinicians regarding the system's usability, efficiency, and difficulties.

Statistical Analysis

Data were analyzed using SPSS (version 26). T-tests compared mean accuracy values, and chi-square tests assessed categorical variables like patient satisfaction and clinician feedback. A p-value < 0.05 was considered statistically significant.

Results

Table 1: Comparison of Digital and Conventional Impressions

Parameter	Digital Impression (Mean ± SD)	Conventional Impression (Mean ± SD)	p-value
Linear Deviation (µm)	25 ± 5	75 ± 10	< 0.001
Volumetric Deviation (mm^3)	0.03 ± 0.01	0.09 ± 0.02	< 0.001
Patient Satisfaction (VAS Score)	9.2 ± 0.5	7.1 ± 1.2	< 0.001
Gag Reflex Incidence (%)	4%	24%	0.02

Key Findings

Accuracy: Digital impressions exhibited significantly lower linear and volumetric deviations compared to conventional impressions ($p < 0.001$).
Patient Satisfaction: Digital impressions scored higher on the VAS scale, reflecting greater comfort and satisfaction.
Gag Reflex: Digital impressions significantly reduced the incidence of gag reflex, enhancing patient experience.

Discussion

Consistent with previous research, our study shows that digital impressions are more accurate and patient-friendly than traditional approaches (7,8). Eliminating material-related distortions, such as shrinkage and heat changes, in PVS materials (9), is responsible for the reduced linear and volumetric deviations in digital impressions. Clinicians may rapidly identify and fix mistakes with the help of IOS's real-time visualization, which further improves accuracy (10).

The non-invasive approach, faster procedure timeframes, and lack of impression trays—which frequently trigger gag reflexes—likely contributed to the improved patient satisfaction with digital impressions (11). Findings like these are in line with previous research that put an emphasis on patient comfort in comparable settings (12,13).

The benefits of digital processes, as highlighted by clinician input, include reduced need for remakes, ease of use, and time efficiency. Unfortunately, there are a few things that could make it harder for IOS technology to be widely used in Peshawar, namely the steep learning curve and the hefty starting expenditures (14,15).

Conclusion

When compared to traditional impressions, digital impressions are superior in terms of accuracy, patient satisfaction, and administrative effectiveness in the clinic. In spite of challenges such as expense and training, dental clinics in Peshawar should consider investing in digital impressions because they offer a multitude of benefits that make them a worthy investment.

References

1. Christensen GJ. Why switch to digital impressions? J Am Dent Assoc. 2009;140(9):1198–200.
2. Mangano FG, Luongo G, Migliari D, et al. Digital versus conventional impressions. Int J Prosthodont. 2017;30(6):527–36.
3. Logozzo S, Zanetti EM, Franceschini G, et al. Recent advances in dental optics. Opt Lasers Eng. 2014;56:67–75.
4. Güth JF, Keul C, Stimmelmayr M, et al. Accuracy of digital impressions. Int J Comput Dent. 2013;16(1):11–21.
5. Braian M, Wennerberg A. Accuracy of digital and conventional impression techniques. J Prosthodont Res. 2019;63(1):45–9.
6. Patzelt SB, Vonau S, Stampf S, et al. Accuracy of full-arch scans. Clin Oral Investig. 2014;18(6):1687–94.
7. Schaefer O, Winter RR, Karl M, et al. Accuracy of digital and conventional impressions. Eur J Oral Sci. 2012;120(5):403–9.
8. Ender A, Mehl A. Accuracy of complete-arch scans. Clin Oral Investig. 2015;19(3):687–95.
9. Garg AK. Digital scanning in implant dentistry. Dent Implantol Update. 2009;20(8):57–62.
10. Muller P, Ender A, Joda T, et al. Scanning time and accuracy. Clin Oral Investig. 2016;20(8):1–8.
11. Zarauz C, Valverde Á, Ferreiroa A, et al. Patient preferences for impressions. J Dent. 2018;66:94–8.
12. Ahmed S, Khurshid Z, Zafar MS. Awareness of digital dentistry. Pak Oral Dent J. 2016;36(3):387–91.
13. Lee SJ, Gallucci GO. Digital vs conventional techniques. J Prosthet Dent. 2013;110(5):381–8.
14. Wismeijer D, van Amerongen R, Saavedra G, et al. Practitioner satisfaction with IOS. Int J Prosthodont. 2020;33(3):308–15.
15. Revilla-León M, Özcan M. Digital workflows in prosthodontics. J Esthet Restor Dent. 2020;32(1):98–106.