

Conventional Impressions Versus Digital Impressions: A Systematic Review "The Art of Accurate Impressions: Revolutionizing Dentistry"

Dr. Syed Ershad Ahmed, Rajasri S, Prithika K

Sri Ramakrishna Dental College and Hospital, Coimbatore, Tamil Nadu, India

Abstract: ***Purpose:** A systematic review of digital impression versus conventional impression is presented. **Material and Methods:** We conducted a systematic literature review by searching three electronic data base namely, PUBMED, MEDLINE and Web Science for papers published between 2002 to 2023. The search resulted in total of 22 articles and research strategy was followed using PRISMA guidelines. The search was limited using these keywords: "conventional impression", " digital impression", "superior accuracy", "accurate fit ", "patient comfort". **Results:** The advantages of digital impressions over traditional methods in the context of prosthetic rehabilitation, particularly in the fields of fixed, removable, and implant prostheses. Both conventional and digital techniques for impression-taking have their roles, but the review focuses on the growing shift toward digital methods due to their increased accuracy, patient comfort, and improved workflow management. Digital impression techniques have been shown to offer superior accuracy and higher patient/operator satisfaction compared to conventional impression techniques. **Conclusion:** According to multiple clinical and preclinical studies, Clinicians should consider this evidence when choosing the best technique for their patients.*

Keywords: digital dental impression, conventional impression method, prosthetic accuracy, patient comfort in dentistry, prosthetic workflow management

1. Introduction

The introduction discusses the adoption of digital impressions in dentistry is on the rise, surpassing traditional methods in popularity among clinicians. Digital impressions offer numerous benefits, including three-dimensional pre-visualization of tooth preparations, cost-effectiveness, and reduced working time. Additionally, digital impressions eliminate the need for tray selection procedures, minimize the risk of distortion and material waste, and enhance patient comfort and acceptance ⁽¹⁾. The primary objective of this project is to conduct a systematic review of in vitro and clinical studies comparing the accuracy of digital versus conventional impressions in both partially and completely edentulous patients. The review focuses on assessing the three-dimensional (3D) accuracy quantitatively as the primary outcome ⁽²⁾. An accurate impression and definitive cast are fundamental to a successful outcome in any prosthodontic rehabilitation ⁽³⁾. This sets the stage for the study, which aims to evaluate the accuracy, marginal fit, time efficient of conventional and digital impressions.

2. Materials and Methods

This systematic review was conducted according to the PRISMA guidelines. A MEDLINE search was performed to identify the studies that evaluate accuracy, marginal fit and time efficient of conventional and digital impressions. The review encompassed both in vivo and in vitro studies. The review was conducted from September 2024 to November 2024.

Inclusive Criteria

- Patient with age group of 18-80 years
- Patient requiring dental restoration, prosthesis, orthodontic treatment.
- Patient with good oral hygiene.

Exclusive Criteria

- Patient with age above 80 years
- Patient with limited mouth opening, severe gag reflex.
- Patient with dental anxiety, uncontrolled periodontal disease, active oral infection.

Table 1: PICO Framework

Population: Human population whose age group between 18-80 years who wants dental restoration, prosthesis, orthodontic treatment for whom impression is indicated.

Intervention: Use of digital impression technique for impression, thereby enhancing patient comfort

Comparison: The accuracy, marginal fit, time efficient of conventional impression comparing with digital impression.

Outcomes: Digital impression shows higher accuracy and time efficient. This shows digital impression offer the patient comfortness and effectiveness.

Screening and Selection of Studies

The screening and selection of the articles was done by three reviewers independently. The reviewers thoroughly discussed the selection criteria. Then, according to the inclusion and exclusion criteria, the reviewers screened the titles of the published records through electronic and hand search.

Initially, the abstracts of all the articles were analyzed, and from the abstracts, the full text of the articles was selected and reviewed. Disagreement with the selection of the articles was sorted out by discussion. Cohen's kappa coefficient was used as a measure of agreement between the reviewers. The kappa score was 0.80 suggesting good interobserver agreement.

Volume 15 Issue 3, March 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

www.ijsr.net

Search strategy

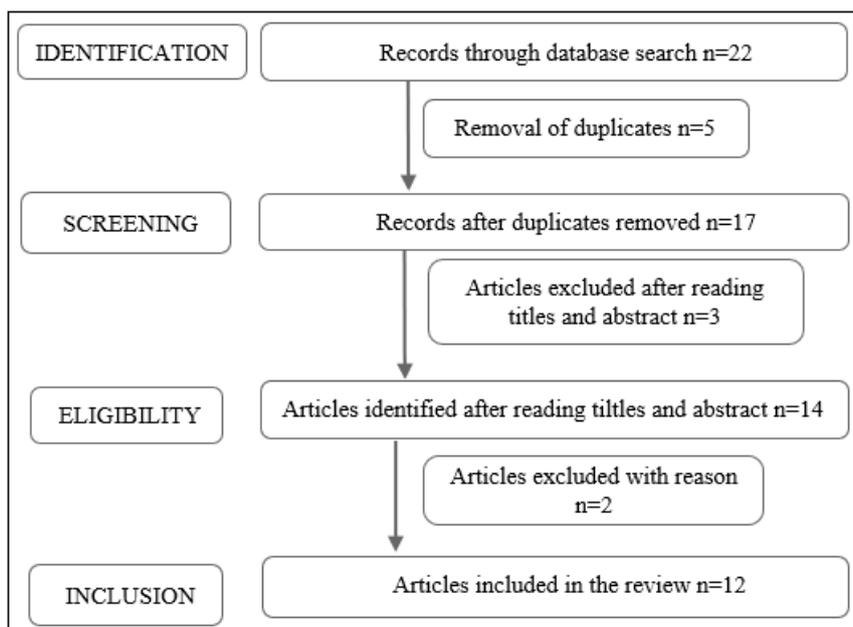
The review included articles from the year 2000–2024. The initial electronic search was conducted by the investigators independently using the following search databases: MEDLINE (PubMed), Google Scholar. The search was limited to English language using the search items/keywords: "Conventional impression ", "digital impression ", "accuracy ", "time efficient ", "marginal fit". In addition to the electronic search, hand search was also done by reviewing the references in the included studies. The search strategy was followed using the PICOS framework.

Data Extraction and Quality Assessment

Data extraction was done based on the inclusion criteria by two reviewers independently. The studies were classified according to study design and outcome variables. Double checking was done by the reviewers. The risk of bias in the articles included in this review was assessed according to the study verification checklist of the "Cohort of the Critical Appraisal Skills Programme".

Table 2: Risk assessment of bias in articles (Cohort of critical appraisal skills programme)

| | 1 | 2 | 3 | 4 | 5a | 5b | 6 | 7 | 8 | Quality assessment |
|---|---|---|---|---|----|----|---|---|---|--------------------|
| Sachin K Chandran et al., 2019 ^[1] | + | + | + | + | + | + | + | + | + | High |
| Komstantinoa M Chochilakis et al., ^[2] | + | + | + | + | + | + | + | + | + | High |
| Kinga Basaki et al., 2017 ^[3] | - | + | + | + | - | + | + | + | + | Moderate |
| Pekka Alholm et al., 2018 ^[4] | + | + | - | + | - | + | + | + | + | Moderate |
| Maris Negucioiu et al., 2024 ^[5] | + | + | - | + | + | + | + | - | + | Moderate |
| Jonathan et al., 2014 ^[6] | + | + | + | + | + | + | + | + | + | High |
| Irina Singh et al., 2022 ^[7] | + | - | + | + | - | + | + | + | + | Moderate |
| Sahr Al Tuwajiri et al., 2018 ^[8] | + | + | + | + | + | + | + | + | + | High |
| Emir yuzbaswglu et al., 2014 ^[9] | + | + | + | + | + | + | + | + | + | High |
| Ender et al., 2015 ^[10] | + | - | - | + | + | + | + | + | + | Moderate |
| MJ Yun et al., 2017 ^[11] | + | + | + | + | + | + | - | + | - | Moderate |
| Suheel Ahmed et al., 2024 ^[12] | + | + | - | + | + | - | + | + | + | Moderate |



| Study author /year | Parameter compared | Scan device and software | Outcomes |
|--|-------------------------------|------------------------------------|---|
| Sachin K Chandran et al., ^[1] | Accuracy | i-Tero | Digital impression is superior to conventional impression |
| Komstantinoa M Chochilakis et al., 2012 ^[2] | Marginal fit | i-Tero | Same marginal discrepancies with conventional impression |
| Kinga Basaki et al.2017 ^[3] | Accuracy | D310 3D Scanner, Elos med tech | Digital impression approach produced less accurate definite casts than conventional approach |
| Pekka Alholm et al., 2018 ^[4] | Time efficient | CERAC | Digital impression technique are faster and shorter operation time |
| Maris Negucioiu et al., 2024 ^[5] | Time efficient | CERAC i -Tero | Digital impression reduces time required than coentional impression |
| Jonathan et al., 2014 ^[6] | Marginal fit | 3 shape d700 laboratry | Better marginal fit in digital impression |
| Irina Singh et al., 2022 ^[7] | Marginal fit / time efficient | CEREC, i -Tero | Digital impression is superior regarding marginal fit and time in comparison with conventional impression |
| Emir Yuzbasioglu et al., 2014 | Time efficient | Sirona CERAC Omni cam | More time efficient |
| Sahr Al Tuwajiri et al., 2018 ^[8] | Accuracy | Trios 3 shape ceopenhagen, denmask | Better marginal fit in digital impression |

| | | | |
|---------------------------------|--------------|-----------------|--|
| Ender et al., 2015 et al., [10] | Accuracy | Lava Cos Cadent | Digital impressio is superior |
| M J Yun et al., 2017 [11] | Marginal fit | i-Tero | Digital mpression is superior |
| Suheel Ahmed et al., 2024 [12] | Accuracy | i-Tero | Increased dture production accuracy and predictability |

3. Discussion

Ultimately, digital impression making offers advantages in time efficiency and patient preference, making it the preferred method when used for the right indications [4]. Advancing dental practice relies heavily on evaluating and improving existing technologies and procedures, including Intraoral Scanning (IOS). This analysis will examine the conclusions of included studies, focusing on key impression parameters such as accuracy, patient-reported outcomes (PROMs), and time expenditure associated with digital scanning in dentistry [5]. It will highlight both the advantages and limitations of current technologies, providing valuable insights for future research directions and developments in the field [9]. This raises the question which is better impression methods. To addresses this question, we designed a systematic review highlights the comparison between digital and conventional impression. In this systematic review total of 12 articles were evaluated. This studies have various outcome and these are categorised as

- Accuracy
- Time efficient
- Marginal fit

Accuracy of conventional and digital impression

Five articles evaluate the accuracy of digital impression and conventional impression. Sachin K Chandran concluded in the study that digital impression are superior to conventional impression without statistically significant difference but based on accuracy patient preference and operator preference [1]. Kinga Basaki et al., concluded in the study that digital impression approach produced less accurate definitive cast than conventional impression [3]. Sahr Al Tuwajiri et al., concluded in the study that conventional impression of edentulous jaw had better accuracy compared to PVS and Trios digital groups [8]. Ender et al., concluded in the study that digital impression method achieve a level of precision comparable to conventional impression [11]. Suheel Ahmed et al., concluded in the study that digital impression advantages over conventional because of better accuracy and reduces the numbe of visits and efficacy [12].

Marginal fit of conventional and digital impression

Three articles evaluate the marginal fit of digital and conventional impression. Komstantino M Chochilakis et al., concluded in the study that digital impression and conventional impression have same marginal discrepancies and increased accuracy [2]. Jonathan et al., concluded in the study that the fully digital fabrication method provided better marginal fit than the commercial method [6]. M J Yun et al., concluded in the study that prosthesis fabricated from the digital impression technique howed more gaps in respect of occlusal surface [11].

Time efficient of conventional and digital impression

Four articles evaluate the time efficient of digital impression and conventional impression. Pekka Alholm et al., concluded in the study that digital impression technique are faster and can shorten the operation time [4]. Maris Negucious et al.,

expressed in the study that digital impression reduces the time required for both quadrant and complete arch compared to traditional impression [5]. Irina Singh et al., concluded in the study that digital impression reduces time and reduces operation time [7]. Emir Yuzbasioglu et al., concluded in the study that digital impression technique are more time efficient than conventional impression [9].

4. Conclusion

From this systematic review, we come to th conclusion that digital dentistry holds promise for improved clinical outcomes, patient experiences, and efficiency. However, it's crucial to ensure affordability, evidence-based decision-making, and patient-centered care. Collaboration and continuous evaluation are necessary to address challenges and refine approaches. By prioritizing these factors, digital dentistry can enhance diagnosis, treatment planning, and restorative outcomes. Ultimately, fulfilling digital dentistry's potential requires a balanced approach that leverages technology to deliver high-quality, accessible, and affordable care that meets the evolving needs of patients and practitioners.

References

- [1] Digital Versus Conventional Impressions in Dentistry: A Systematic Review
- [2] Digital Vs Conventional Implant Impressions Panos Paspaspyridakos DDS, MS, PhD1, Konstantinos Vazouras DDS, MPhil, MDS, FACP2, Yo-wei Chen DDS, MSc, FACP2, Elli Kotina DDS, MS3, Zuhair Natto DDS, MSc, DrPH4, Kiho Kang DMD, MS, FACP5, Konstantinos Chochlidakis DDS, MS, FACP
- [3] Accuracy of Digital vs Conventional Implant Impression Approach: A Three-Dimensional Comparative In Vitro Analysis Kinga Basaki, DMD, MSc, FRDC (C) 1/Hasan Alkumru, DDS, MSc, PhD, FRCD (C) 2/ Grace De Souza, DDS, MSc, PhD3/Yoav Finer, DMD, MSc, PhD, FRCD (C) 4
- [4] Digital Versus Conventional Impressions in Fixed Prosthodontics: A Review Pekka Ahlholm, 1 Kirsi Sipilä, DDS, PhD, 1, 2, 3, 4, 5 Pekka Vallittu, DDS, PhD, CDT, 6, 7, 8 Minna Jakonen, DDS, PhD, 9 & Ulla Kotiranta, DDS, 1, 10
- [5] DIGITAL IMPRESSIONS VERSUS TRADITIONAL IMPRESSIONS: AN OVERVIEW ON ACCURACY, TIME AND PATIENT Marius Negucioiu1†, Smaranda Buduru1†, Diana Coman3, Ana-Maria Condor1, 2, 3*, Antonela Berar1, Daniela Condor4, Rareş Buduru5, Andreea Kui1
- [6] A comparison of the marginal fit of crowns fabricated with digital and conventional methods Jonathan Ng, DDS, MSc, a Dorin Ruse, MSc, PhD, MCIC, b and Chris Wyatt, DMD, MSc
- [7] Digital Impression in Dentistry-A Comprehensive Review Irina Singh1 *, Kavipal Singh2, Nimish Sethi2

- [8] Multiple implants impression accuracy of edentulous jaw: digital and conventional implant impression comparative study by Sahr AlTuwaijri
- [9] Comparison of digital and conventional impression techniques: evaluation of patients' perception, treatment comfort, effectiveness and clinical outcomes Emir Yuzbasioglu*, Hanefi Kurt, Rana Turunc and Halenur Bilir
- [10] In vivo precision of conventional and digital methods for obtaining quadrant dental impressions Andreas Ender 1 & Moritz Zimmermann1 & Thomas Attin2 & Albert Mehl 1
- [11] Comparison of the fit of cast gold crowns fabricated from the digital and the conventional impression techniques Mi-Jung Yun, Young-Chan Jeon, Chang-Mo Jeong, Jung-Bo Huh
- [12] Digital Impressions Versus Conventional Impressions in Prosthodontics: A Systematic Review Suhael Ahmed, Abeer Hawsah, Randa Rustom, Abeer Alamri, Sameer Althomairy, Alenezi, Sarah Shaker, Faisal Alrawsaa, Ahmed Althumairy, Abdullah Alteraigis