SUNTEXT REVIEWS

SunText Review of Dental Sciences
ISSN: 2766-4996

Open Access
Review Article
Volume 7:1

Ultrasonic Impressions in Prosthodontics and Oral Implantology

Arpit S*

Professor & Post Graduate Teacher, Department of Prosthodontics, Crown & Bridge and Oral Implantology, Bhojia Dental College & Hospital, Budh (Baddi), Teh. Baddi, Distt. Solan, Himachal Pradesh, India

***Corresponding author:** Arpit S, Professor & Post Graduate Teacher, Department of Prosthodontics, Crown & Bridge and Oral Implantology, Bhojia Dental College & Hospital, Budh (Baddi), Teh. Baddi, Distt. Solan, Himachal Pradesh, India; E-mail: arpitsikri@gmail.com

Received date: 16 February 2026; **Accepted date:** 23 February 2026; **Published date:** 28 February 2026

Citation: Arpit S (2026) Ultrasonic Impressions in Prosthodontics and Oral Implantology. SunText Rev Dental Sci 7(1): 191.

DOI: https://doi.org/10.51737/2766-4996.2026.191

Abstract

Accurate impressions form the cornerstone of successful prosthodontic and implant restorative outcomes. While traditional impression materials and techniques (alginate, polyvinyl siloxane, polyether) have long been used, their limitations especially for implant prostheses have driven innovation toward digital capture technologies. In parallel, ultrasonic methods have been explored for diagnostic imaging in dentistry, but direct application to impression making remains nascent. This narrative review examines the theoretical basis of ultrasonic approaches, compares them with established digital and conventional impression methods, and discusses potential roles and challenges in prosthodontics and oral implantology. Scientific literature relevant to impression accuracy, digital scanning, and ultrasound in dental applications was reviewed. The review concludes that while ultrasonic imaging offers compelling diagnostic value, its role in direct impression acquisition is under-researched. Future research could bridge this gap by integrating ultrasonic data capture with digital workflows.

Keywords: Conventional impression techniques; Digital impressions; Intraoral scanning; Oral implantology; Prosthodontics; Ultrasonic impressions

Introduction

Impressions are the foundation on which accurate prostheses and implant restorations are designed and fabricated. Conventional impressions rely on elastomeric materials and trays to capture an oral negative, then poured into models. Despite their widespread use, these techniques are subject to distortions, dimensional changes, and patient discomfort. Digital impression systems including intraoral scanners offer alternatives that eliminate physical materials, provide rapid data acquisition, and integrate seamlessly into computer-aided design/manufacturing (CAD/CAM) workflows. In parallel, ultrasound technologies have grown in diagnostic applications across dentistry, such as assessing soft tissues, peri-implant bone, and mucosal thickness. However, ultrasonic methods for direct three-dimensional impression capture in prosthodontics and implantology are still conceptual or experimental. This narrative review examines the basis for ultrasonic approaches, summarizes relevant literature, and discusses how ultrasonic imaging may contribute to, or integrate with, current impression and scanning methodologies.

Discussion

Conventional impression techniques

Conventional impression materials like polyvinyl siloxane (PVS) and polyether are widely used due to their favorable accuracy and dimensional stability. They remain the standard for many implant and prosthetic workflows, especially where digital access is limited. Yet, limitations include handling errors, deformation, and patient discomfort due to bulk and setting time. Additionally, storage and casting introduce further opportunities for error.

Digital impression technologies

Intraoral scanners (IOS) have revolutionized impression making in prosthodontics and implantology. These systems use optical

technologies (structured light, confocal imaging) to generate accurate three-dimensional digital models. A robust body of evidence shows that digital impressions can be as accurate or in some situations more accurate than conventional impressions, particularly for fixed crowns and partial implant scenarios. Multiple systematic reviews indicate that digital scanning and conventional impression techniques often exhibit no significant difference in accuracy for many fixed prosthetic applications. However, for complete-arch implant restorations, conventional techniques may demonstrate improved trueness in certain contexts, though results are mixed. Digital impressions offer advantages such as improved patient comfort, reduced chair time, the ability to rescan missed areas, and elimination of physical model storage.

Ultrasound in dentistry

Ultrasound has strong diagnostic utility in periodontology and implantology. It can assess soft tissue thickness, peri-implant mucosal dimensions, and bone topography. Ultrasonic devices provide real-time feedback without ionizing radiation, useful in implant planning and monitoring peri-implant health post-surgery. However, there is limited evidence on ultrasonic methods for direct impression acquisition akin to optical or digital scanning. Ultrasound's typical use in dentistry remains imaging rather than shape capture for prosthetic fabrication, and there are no well-documented clinical protocols for ultrasonic impression capture in fixed or removable prosthodontics.

Ultrasonic impressions conceptual considerations

The term "ultrasonic impressions" implies using ultrasonic waves to capture the geometry of the oral cavity, analogous to optical scanning. In theory, ultrasonic backscatter, time-of-flight, or amplitude data could map surfaces in three dimensions. Research in other fields (e.g., material science) demonstrates ultrasonic backscattering's ability to characterize complex shapes. Adapting these principles to intraoral use would require high-resolution ultrasonic transducers, advanced signal processing, and integration into CAD workflows. To date, such technologies are largely conceptual within dentistry.

Potential advantages of ultrasonic capture could include

- Enhanced penetration through opaque media (saliva, reflective surfaces).
- Reduced dependence on direct line of sight, potentially overcoming optical scan limitations.
- Non-ionizing, non-contact three-dimensional data acquisition**.**

Challenges include

- Limited spatial resolution compared to optical scanners.
- Complex signal interpretation.
- Lack of clinical devices or validation studies.

Because of these barriers, current dental practice relies predominantly on optical and conventional impression techniques, with ultrasound serving predominantly diagnostic roles [1-6].

Conclusion

Impression accuracy is critical in prosthodontics and implantology. Conventional elastomeric impressions remain reliable, but digital intraoral scanning has gained traction due to patient comfort, speed, and integration with CAD/CAM workflows. Ultrasonic methods currently have minimal clinical evidence for direct impression acquisition. While ultrasonic imaging shows promise for diagnostic and peri-implant evaluation, further research is required to validate ultrasonic impression capture technologies. Clinicians should continue to adopt evidence-based impression techniques tailored to clinical needs, recognizing the potential of future technologies possibly including ultrasonic scanning to further enhance prosthetic outcomes.

References

1. Ahlholm P, Sipila K, Vallittu P, Jakonen M, Kotiranta U. Digital versus conventional impressions in fixed prosthodontics: a review. J Prosthodont. 2016; 26: 4-16.
2. Joda T, Bragger U. Digital vs. conventional implant prosthetic workflows: A cost/time analysis. Clin Oral Implants Res. 2014; 26: 1430-1435.
3. Kaitatzidou A, Chalazoniti A, Faggion CM, Bakopoulou A, Barbosa-Liz DM, Giannakopoulos NN. Digital scans versus conventional impressions in fixed prosthodontics: an overview of systematic reviews. J Prosthet Dent. 2024; 134: 2156-2164.
4. Janosi KM, Cerghizan D, Martha KI, Eva Elekes, Szakacs B, Elekes Z et al. Evaluation of Intraoral Full-Arch Scan versus Conventional Preliminary Impression. J Clin Med. 2023; 12: 5508.
5. Saluja H, Sachdeva S, Singh MV. Ultrasound in periodontology and implantology. IP Int J Periodontol Implantol. 2024; 9: 113-122.
6. Marques S, Ribeiro P, Falcao C, Lemos BF, Rios-Carrasco B, Rios-Santos JV et al. Digital Impressions in Implant Dentistry: A Literature Review. Int J Environ Res Public Health. 2021; 18: 1020.