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Accuracy of digital impression taking versus conventional impression taking in partially dentate patients: A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 7 March 2025 and was last updated on 14 April 2025.

Abstract

Background: Digital impression techniques using intraoral scanners (IOS) are increasingly adopted in implant prosthodontics. They offer workflow efficiency and patient comfort, but their clinical accuracy is unclear compared to conventional elastomeric impressions, especially in partially dentate patients.

Objective: To compare the accuracy of digital and conventional impression techniques in partially dentate patients undergoing implant-supported prosthodontic treatment.

Methods: A systematic review and meta-analysis were conducted in accordance with PRISMA 2020 guidelines. Seven clinical studies were included, involving 151 patients across digital and conventional impression groups. Various IOS devices were compared to conventional techniques using polyvinyl siloxane or polyether materials. The primary outcomes were angular and linear deviations, inter-implant distances, and scan-body misfit. A random-effects model with inverse variance weighting was used to calculate standardised mean differences (SMDs) for angular displacement and overall deviation. Statistical significance was set at $p \leq 0.05$.

INTRODUCTION

Review question / Objective This systematic review aims to assess the accuracy of digital impression taking versus conventional impression taking in partially dentate patients undergoing implant prosthodontic treatment. The primary objective is to evaluate 3D accuracy based on implant deviation measurements and determine whether any observed differences are clinically significant.

Rationale Digital impression techniques are gaining prominence in implant dentistry due to their efficiency, patient comfort, and potential for improved accuracy. However, there is a need to systematically assess whether digital impressions provide comparable or superior accuracy to conventional impressions in partially dentate

patients. This review will synthesise available evidence on the accuracy of these two techniques, with a focus on clinically relevant outcomes.
Condition being studied Partially dentate patients requiring implant prosthodontic treatment, with a focus on impression accuracy.

METHODS

Search strategy Electronic databases including PubMed, Scopus, Web of Science, Cochrane Library, and Embase will be searched. The search terms will include "digital impression," "conventional impression," "implant accuracy," "partially edentulous," "partially dentate", and "intraoral scanner." Grey literature and conference proceedings will also be screened.

Participant or population Partially dentate patients undergoing implant prosthodontic treatment.

Intervention Digital impression techniques using intraoral scanners.

Comparator Conventional impression techniques using elastomeric materials.

Study designs to be included Randomised controlled trials (RCTs); Non-randomised clinical studies.

Eligibility criteria
Inclusion criteria
- Studies assessing 3D accuracy of digital versus conventional implant impressions.
- Studies involving partially dentate patients.

Exclusion criteria
- Studies not measuring quantitative implant deviation.
- Case reports, opinion papers, and narrative reviews.

Information sources Electronic databases, reference lists of relevant studies, contact with study authors, and screening of grey literature.

Main outcome(s) 3D accuracy of digital versus conventional impressions, assessed by implant deviation measurements.

Additional outcome(s)
- Influence of implant angulation on accuracy.
- Effect of different intraoral scanners.
- Clinical significance of differences in accuracy.

Data management A structured data extraction form will be used to collect relevant study characteristics, methodologies, and results. Data will be stored in a secure, cloud-based database.

Quality assessment / Risk of bias analysis The Cochrane Risk of Bias tool (for RCTs), CONSORT (if applicable), and the Newcastle-Ottawa Scale (for observational studies) will be used.

Strategy of data synthesis A meta-analysis will be conducted where appropriate. If high heterogeneity is detected, a narrative synthesis will be used. Subgroup analyses will be performed based on impression technique, implant angulation, and scanner type.

Subgroup analysis
- Implant angulation
- Type of intraoral scanner used
- Medical history (if applicable).

Sensitivity analysis A sensitivity analysis will be performed to assess the impact of study quality on findings, excluding studies with high risk of bias.

Country(ies) involved Australia.
Keywords Digital impression; Conventional impression; Implant accuracy; Intraoral scanner; Prosthodontics.

Dissemination plans Findings will be submitted for publication in a peer-reviewed dental journal and presented at relevant conferences.

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