

# INPLASY PROTOCOL

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**Conflicts of interest:**  
None declared.

## Accuracy in marginal and/or internal adaptation of full-coverage fixed prostheses made with digital versus conventional impressions: an overview of systematic reviews and meta-analysis

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**Review question / Objective:** Is the accuracy (marginal adaptation and / or internal adaptation) of fixed full coverage prostheses made with digital impressions better than conventional impressions?

**Eligibility criteria:** Inclusion criteria: Systematic reviews and / or meta-analyzes that evaluated the precision (marginal adaptation and / or internal adaptation) of full coverage fixed prostheses on natural teeth in clinical studies and on tooth replicas in in vitro studies. Systematic reviews and / or meta-analyzes comparing digital impressions with an intraoral scanner versus conventional impressions taken with any impression material. Systematic reviews and / or meta-analyzes of randomized clinical trials (RCTs), prospective comparative and in vitro and non-randomized clinical trials. Exclusion criteria: Systematic literature reviews, case reports, pilot studies. Studies evaluating the seating of crowns on implants and partial restorations. Studies with no response from the author to the requested information query.

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 07 October 2021 and was last updated on 07 October 2021 (registration number INPLASY2021100024).

### INTRODUCTION

**Review question / Objective:** Is the accuracy (marginal adaptation and / or internal adaptation) of fixed full coverage prostheses made with digital impressions better than conventional impressions?

**Rationale:** Several studies have focused on analyzing conventional and digital impressions techniques, concluding that both procedures are clinically acceptable and therefore highly recommended, however, when studying the comparative

precision of both techniques begin to describe results that can still be considered controversial<sup>11,12</sup>; therefore, on some occasions they suggest the superiority of conventional technique over digital and in others, they give a wide margin of accuracy to the digital technique when compared with the conventional one, thus confusing the professional who must make a scientifically supported clinical decision regarding the use of one of the two techniques, in order to offer high-quality prosthetic work with the longest possible durability. A systematic review of the scientific literature could be beneficial to assess the precision of these two systems in a more comprehensive way. The main objectives of several available systematic reviews, which effectively compare the digital and conventional impression technique, have been: the survival of the restorations, the efficiency of time spent in the impression, the perception and comfort of the operator, the satisfaction of the patient and the internal fit, together with the marginal precision of the fabricated prostheses<sup>11,12,13,14</sup>. In addition, a wide range of restorative types (individual prostheses, short and long section, multiple units and full arch) and types of restorative materials (zirconia, lithium disilicate, alumina, glass ceramic) have been included in these review studies<sup>12,13,15</sup>. This indicates that there is abundant systematic information in this regard, but unfortunately, the results obtained still do not satisfy the expected scientific rigor, because when making a cursory analysis of the articles published on the subject, many of them do not comply with the minimum of technical considerations necessary to guarantee the validity of the information evaluated and published. For this reason, this "Overview" has been proposed, which is nothing more than a technical and scientific review of the systematic reviews currently published about the precision (marginal adaptation and / or internal adaptation) of full coverage fixed prostheses, made with digital impressions versus conventional impressions, in order to verify, by means of compliance with the minimum requirements established by the scientific community in the AMSTA II tool,

the validity and reliability of each of these reviews and thus be able to issue a more accurate conclusion of clinical applicability, considering the diametrical importance of a good dental impression when manufacturing fixed restorations that ensure survival to long term.

**Condition being studied:** Computer-aided design and fabrication (CAD / CAM) has been used in the fabrication of restorations dentures, especially ceramic crowns and fixed prostheses, since the 1980s<sup>1</sup>. Dental prostheses are believed to fixed, manufactured from intraoral digital impressions present notable advantages over those obtained by means of conventional impressions, in various aspects<sup>2,3</sup>. To name a few, fingerprints can prevent accuracy errors in the seating of dental prostheses, more than a conventional impression could<sup>4</sup>. In addition, they considerably save clinical work time compared to conventional impressions, while, they reduce the general operating cost of the procedure, by eliminating certain materials necessary for the manufacture of diagnostic and working models<sup>5</sup>. Recent developments in the field of digital impression, together with great technical and scientific progress, have generated various excellent quality intraoral scanning systems over the past two decades. At present, a number an increasing number of fixed prostheses are manufactured with intraoral digital impressions, which is why this technique has become a fundamental part of digitalization in prosthodontics<sup>6</sup>. A good quality fixed prosthesis that ensures longevity of treatment is measured by marginal precision and fit internal between the abutment and the restoration. Likewise, factors such as dental hypersensitivity, recurrent caries, dissolution Cement, plaque retention, and periodontal problems are the most common restorative margin measures poorly adjusted<sup>7,8</sup>. Digital scanning with intraoral scanners, as part of a digital workflow, has been introduced to reduce all the micro-adaptation errors and subsequent problems that conventional impression techniques could cause<sup>9,10</sup>.

## METHODS

**Search strategy:** PUBMED ("posterior fixed" OR "dental porcelain"[Mesh] OR "single-unit" OR "crowns"[Mesh] OR "full-coverage restorations" OR "fixed prosthodontics" OR "fixed dental prostheses" ) AND ("digital" OR "digital scans" OR "digital impressions") AND ("conventional impressions" OR "manual impressions" OR "conventional") AND ("accuracy" OR "adaptations" OR "dimensional accuracy" OR "marginal fit" OR "internal fit" OR "adjustment") AND ("systematic review and meta-analysis" OR "systematic review" OR "meta- analysis")

WOS TEMA: (("posterior fixed" OR "dental porcelain" OR "single-unit" OR "crowns" OR "full-coverage restorations" OR "fixed prosthodontics" OR "fixed dental prostheses" )) AND TEMA: (("digital" OR "digital scans" OR "digital impressions")) AND TEMA: (("conventional impressions" OR "manual impressions" OR "conventional")) AND TEMA: (("accuracy" OR "adaptations" OR "dimensional accuracy" OR "marginal fit" OR "internal fit" OR "adjustment")) AND TEMA: (("systematic review and meta-analysis" OR "systematic review" OR "meta-analysis"))

SCOPUS ( TITLE-ABS-KEY ( ( "posterior fixed" OR "dental porcelain" OR "single-unit" OR "crowns" OR "full-coverage restorations" OR "fixed prosthodontics" OR "fixed dental prostheses" ) ) AND TITLE-ABS-KEY ( ( "digital" OR "digital scans" OR "digital impressions" ) ) AND TITLE-ABS-KEY ( ( "conventional impressions" OR "manual impressions" OR "conventional" ) ) AND TITLE-ABS-KEY ( ( "accuracy" OR "adaptations" OR "dimensional accuracy" OR "marginal fit" OR "internal fit" OR "adjustment" ) ) AND TITLE-ABS-KEY ( ( "systematic review and meta-analysis" OR "systematic review" OR "meta-analysis" ) ) )

GOOGLE SCHOLAR in title: ("crowns") AND ("digital impressions") AND ("conventional impressions") AND ("accuracy") AND ("systematic review and meta- analysis").

**Participant or population:** Fixed full coverage dentures on natural teeth.

**Intervention:** Digital impressions.

**Comparator:** Conventional impressions.

**Study designs to be included:** Systematic reviews and / or meta-analyses of randomized clinical trials (RCTs), prospective comparative and in vitro and non-randomized clinical trials.

**Eligibility criteria:** Inclusion criteria: Systematic reviews and / or meta-analyses that evaluated the precision (marginal adaptation and / or internal adaptation) of full coverage fixed prostheses on natural teeth in clinical studies and on tooth replicas in in vitro studies. Systematic reviews and / or meta-analyses comparing digital impressions with an intraoral scanner versus conventional impressions taken with any impression material. Systematic reviews and / or meta-analyses of randomized clinical trials (RCTs), prospective comparative and in vitro and non-randomized clinical trials. Exclusion criteria: Systematic literature reviews, case reports, pilot studies. Studies evaluating the seating of crowns on implants and partial restorations. Studies with no response from the author to the requested information query.

**Information sources:** • PUBMED • WEB OF SCIENCE • SCOPUS - Gray Literature • GOOGLE SCHOLAR • REDALYC • NEW YORK ACADEMIC OF MEDICIN GRAY LITERATURE REPORT.

**Main outcome(s):** • marginal and internal adaptation • marginal fit • marginal discrepancy.

**Additional outcome(s):** None.

**Data management:** The selection of the studies will be carried out in 3 phases. In phase 1, the studies will be selected independently by 2 reviewers (M.A.C and M.C.), reading the titles and abstracts in detail to determine if each article meets the predetermined requirements to be selected, but if the title and abstract do not provide sufficient information, the complete article will be analyzed. Thereafter, phase 2

will be conducted, which will consist of full-text reading, performed independently by the two reviewers. A third and fourth reviewer (J. A. and Y.A.) will be consulted in case of disagreements and finally, in phase 3, the study will be excluded because it does not meet the inclusion requirements.

#### Quality assessment / Risk of bias analysis:

The methodology of selected systematic reviews and meta-analysis will be evaluated by using the AMSTAR II instrument, being a questionnaire with 16 domains with yes, no or partial yes answer options, of which 7 domains are considered critical, given that they can substantially affect the validity of a review and its conclusions. Finally, research can be classified into 4 levels of confidence: high, moderate, low and critically low, although AMSTAR II does not intend to generate an overall score, the purpose of this tool is to identify high quality systematic reviews.

**Strategy of data synthesis:** Criteria under which the data will be synthesized: Systematic reviews and meta-analysis that meet the inclusion criteria. Data to be summarized: marginal and internal adaptation in microns (weighted mean difference), impression digital (relative risk), impression conventional (relative risk). The formal method of combining individual study data will be a narrative synthesis, in relation to each outcome and precision of each impression technique Color charts will be constructed, illustrating whether that study showed better results for the test group or control group. A quantitative synthesis is not planned.

**Subgroup analysis:** None.

**Sensitivity analysis:** None.

**Language:** There will be no language restriction.

**Country(ies) involved:** Ecuador.

**Other relevant information:** References: 1. Mormann WH: The evolution of the CEREC system. *J Am Dent Assoc* 2006; 137:7S-13S 2. Syrek A, Reich G, Ranftl D, et al: Clinical

evaluation of all-ceramic crowns fabricated from intraoral digital impressions based on the principle of active wavefront sampling. *J Dent* 2010; 38:553-559. 3. Seelbach P, Brueckel C, Wostmann B: Accuracy of digital and conventional impression techniques and workflow. *Clin Oral Investig* 2013; 17:1759-1764. 4. Haddadi Y, Bahrami G, Isidor F. Accuracy of Intra-Oral Scans Compared to Conventional Impression in Vitro. *Prim Dent J*. 2019 Nov 1;8(3):34-39. 5. Hans JS. Dental impressions: Metal rim lock trays. *Br Dent J*. 2016 Feb 12;220(3):89-90. 6. Galhano GA, Pellizzer EP, Mazaro JV: Optical impression systems for CAD-CAM restorations. *J Craniofac Surg* 2012;23: 575-579. 7. Abdel-Azim T, Rogers K, Elathamna E, Zandinejad A, Metz M, Morton D. Comparison of the marginal fit of lithium disilicate crowns fabricated with CAD-CAM technology by using conventional impressions and two intraoral digital scanners. *J Prosthet Dent* 2015; 114:554-9. 8. Dauti R, Cviki B, Franz A, Schwarze UY, Lilaj B, Rybaczek T, et al. Comparison of marginal fit of cemented zirconia copings manufactured after digital impression with lava C.O.S and conventional impression technique. *BMC Oral Health* 2016; 16:129. 9. Tabesh M, Alikhasi M, Siadat H. A Comparison of implant impression precision: Different materials and techniques. *J Clin Exp Dent* 2018;10: e151-7. 10. Chochlidakis KM, Papaspyridakos P, Geminiani A, Chen CJ, Feng IJ, Ercoli C. Digital versus conventional impressions for fixed prosthodontics: A systematic review and meta-analysis. *J Prosthet Dent* 2016; 116:184-90. e12. 11. Euan R, Figueras-Alvarez O, Cabratosa-Termes J, Oliver-Parra R. Marginal adaptation of zirconium dioxide copings: influence of the CAD-CAM system and the finish line design. *J Prosthet Dent* 2014; 112:155-62. 12. Cetik S, Bahrami B, Fossoyeux I, Atash R. Adaptation of zirconia crowns created.

**Keywords:** Marginal fit; internal fit; conventional impressions; digital impressions; prostheses fixed; systematic review.

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**Dissemination plans:** Publication in indexed journals.

**Contributions of each author:**

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