PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	**FULLY REPORTED** p. 1 — Title. The title explicitly identifies the report as a "Systematic Review and Meta-analysis."
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	**PARTIALLY REPORTED** pp. 1–2 — Abstract. Background/objective, methods, information sources, study count, quantitative synthesis, main results, and conclusion are reported; however, the manuscript does not explicitly map the abstract to the separate PRISMA 2020 for Abstracts checklist.
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	**FULLY REPORTED** pp. 3–4 — Introduction. The rationale is developed from limitations of previous reviews, the predominance of in vitro evidence, the limited clinical evidence, and the need for an updated clinical synthesis.
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	**FULLY REPORTED** p. 3–4 — Introduction, final paragraph / Focused Question. The objective explicitly states that the review evaluates and compares marginal and internal fit of CAD/CAM zirconia fixed restorations fabricated using digital versus analogue workflows in human participants.
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	**FULLY REPORTED** p. 4 — Sections 2.2–2.3. PICO, inclusion/exclusion criteria, outcome definitions, publication period, language restriction, and clinical-study eligibility are

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			explicitly specified; quantitative syntheses are separated by outcome and comparability.
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	**FULLY REPORTED** pp. 4–5 — Section 2.4 Information Sources. PubMed/MEDLINE, Embase, Web of Science, Cochrane CENTRAL, IEEE Xplore, ClinicalTrials.gov, Google Scholar, and reference-list screening are identified; last search date is 30 June 2026.
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	**Fully REPORTED** pp. 4–5 — Section 2.4 and Table 1. Full database-specific search strings are provided, and any filters or limits were applied
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	**FULLY REPORTED** pp. 5–6 — Section 2.5. Two independent reviewers screened titles/abstracts and full texts; disagreements were resolved by consensus/third-reviewer consultation; Rayyan QCRI was used; inter-rater agreement is reported.
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	**FULLY REPORTED** p. 6 — Section 2.6. Two reviewers independently extracted data using a standardized pilot-tested form, with third-reviewer verification. No investigator-contact process is reported, but none is claimed as necessary.
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	**Fully REPORTED** p. 6 — Section 2.6. Marginal and internal fit are defined as separate outcome domains and the extracted statistics, locations, and methods are specified
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources).	**PARTIALLY REPORTED** p. 6 — Section 2.6.

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		Describe any assumptions made about any missing or unclear information.	Study, sample, restoration, intervention, comparator, and outcome variables are listed; however, assumptions or procedures for missing/unclear information are not explicitly described.
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	**FULLY REPORTED** pp. 6–7 — Section 2.7. RoB 2 and ROBINS-I are identified according to study design; two reviewers assessed independently; domains are described; disagreements were resolved by consensus.
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	**FULLY REPORTED** p. 7 — Section 2.8. Mean difference in µm is specified for marginal and internal fit, with direction defined as digital minus analogue.
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	**FULLY REPORTED** p. 7 — Section 2.8, supported by Results pp. 17–22. Studies were included in a synthesis only when outcomes were clinically/methodologically comparable and a valid effect estimate could be derived; regional internal-fit syntheses were handled separately.
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	**FULLY REPORTED** p. 7 — Section 2.8. The paired-data variance calculation is described, including the prespecified within-pair correlation r=0.50 and sensitivity values r=0.25 and r=0.75.
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	**PARTIALLY REPORTED** pp. 6–8 and 17–23 — Tables 2–7 and Figures 1–6 present study characteristics, individual results, and syntheses, but the Methods do not explicitly describe the planned process for tabulating/visually

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			displaying results.
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	**PARTIALLY REPORTED** p. 7 — Section 2.8. REML random-effects models, Hartung–Knapp-adjusted CIs, I^2, τ^2, prediction intervals, and rationale for separate outcome syntheses are described. The statistical software/package used is not reported.
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	**PARTIALLY REPORTED** p. 7 and pp. 21–22. Exploratory location-specific analyses were used to examine regional variation, but no explicit method for investigating/attributing possible causes of between-study heterogeneity (e.g., prespecified subgroup characteristics or meta-regression) is described.
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	**FULLY REPORTED** p. 7 — Section 2.8. Sensitivity analyses using r=0.25 and r=0.75 are prespecified; results are reported in pp. 19–21.
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	**FULLY REPORTED** p. 7 — Section 2.9. Formal reporting-bias assessment, funnel plots, and asymmetry tests were not performed because fewer than 10 studies contributed to each meta-analysis; the rationale is stated.
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	**FULLY REPORTED** pp. 7–8 — Section 2.10. GRADE was used, with consideration of risk of bias, inconsistency, indirectness, imprecision, and potential publication bias.
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	**FULLY REPORTED** p. 8 and Figure 1 (p. 6). The search yielded 2,422 records, 128 reports underwent full-text

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			assessment, and 10 clinical studies were included; the selection process is presented in a PRISMA flow diagram.
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	**NOT REPORTED** No specific list of potentially eligible full-text reports that were excluded, with study-level exclusion reasons, is provided in the manuscript.
Study characteristics	17	Cite each included study and present its characteristics.	**FULLY REPORTED** pp. 8–14 — Section 3.2 and Table 2. All 10 included studies are cited and their design, sample, groups, restoration, materials, scanners, milling, cement space, analogue method, CAD software, outcomes, and conclusions are presented.
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	**FULLY REPORTED** pp. 15–16 — Section 3.3 and Figures 2–3. Risk-of-bias assessments are presented for the five non-randomized studies using ROBINS-I and five randomized studies using RoB 2.
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	**PARTIALLY REPORTED** pp. 16–20 and Tables 2–5. Study-level summary statistics are reported for the quantitatively synthesized continuous outcomes and qualitative outcomes are summarized in Table 2; however, effect estimates with precision are not provided for every outcome from every included study.
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	**FULLY REPORTED** pp. 15–17 and 23–24. Contributing studies are described by design and methodological features, and risk-of-bias concerns are summarized before/interpreted alongside the syntheses.

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	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	**FULLY REPORTED** pp. 17–23 and Figures/Tables 4–7. All reported statistical syntheses include pooled estimates, CIs, direction of effect, and heterogeneity measures; regional analyses are also reported.
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	**FULLY REPORTED** pp. 21–22. Exploratory location-specific internal-fit analyses are reported, including pooled estimates, CIs, P values, I^2, and interpretation of the marked heterogeneity.
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	**FULLY REPORTED** pp. 19–21 and Tables 4 and 6. All correlation-sensitivity analyses for r=0.25, 0.50, and 0.75 are reported for both primary outcomes.
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	**FULLY REPORTED** p. 7 and discussion p. 25. The manuscript explicitly states that formal assessment of reporting bias was not conducted because fewer than 10 studies contributed to each meta-analysis and explains the limitation.
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	**FULLY REPORTED** pp. 22–23 and Table 7. GRADE certainty is presented as very low for marginal fit and overall internal fit, with reasons for downgrading described.
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	**FULLY REPORTED** pp. 23–25 — Discussion. Findings are interpreted in relation to previous systematic reviews and clinical evidence.
	23b	Discuss any limitations of the evidence included in the review.	**FULLY REPORTED** pp. 24–25 — Discussion. Limitations of the evidence include heterogeneity, non-

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			standardized landmarks, unavailable within-pair correlations, limited quantitative pooling, and inability to formally assess publication bias.
	23c	Discuss any limitations of the review processes used.	**FULLY REPORTED** pp. 25–26 — Discussion. Limitations of the review process are explicitly discussed, including the small number of comparable studies and assumptions required for paired variance estimation.
	23d	Discuss implications of the results for practice, policy, and future research.	**FULLY REPORTED** pp. 25–26 — Discussion and Conclusions. Clinical implications and priorities for future studies, including standardized definitions, measurement protocols, and reporting of paired outcomes, are provided.
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	**FULLY REPORTED** p. 4 — Section 2.1. PROSPERO registration is explicitly reported: CRD42024550353.
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	**NOT REPORTED** The manuscript provides the PROSPERO registration number but does not state where the full review protocol can be accessed, nor explicitly state that the protocol is unavailable.
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	**NOT REPORTED** No statement describing whether amendments were made to the registered protocol or explaining any amendments is provided.
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	**FULLY REPORTED** p. 26 — Funding statement. The review received no external funding.
Competing interests	26	Declare any competing interests of review authors.	**FULLY REPORTED** p. 26 — Conflicts of Interest. The authors

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Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	**PARTIALLY REPORTED** p. 26 — Data Availability Statement. Quantitative-analysis data are available from the corresponding author upon reasonable request, but public availability/location of the extraction form, extracted dataset, analytic code, and other review materials is not specified.

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