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Efficacy of Bioactive Glass Vs Traditional Bone Grafts in Maxillofacial Reconstruction: A systematic Review and Meta-analysis of Clinical Outcomes

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ADMINISTRATIVE INFORMATION

Support - King Khalid University.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202540089

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 25 April 2025 and was last updated on 25 April 2025.

INTRODUCTION

Review question / Objective To compare the efficacy of bioactive glass (BG) versus autogenic bone grafts in maxillofacial reconstruction, focusing on bone volume retention, new bone formation, resorption rate, and biomaterial retention.

Rationale Autogenic grafts face limitations like donor-site morbidity and resorption, necessitating exploration of alternatives like BG for improved clinical outcomes.

Condition being studied Maxillofacial bone defects requiring reconstruction due to trauma, congenital anomalies, or pathological conditions.

METHODS

Search strategy Comprehensive searches in PubMed, Scopus, Web of Science, Cochrane Library, and Elsevier databases up to March 2025 using PRISMA guidelines.

Participant or population Patients undergoing maxillofacial reconstruction requiring bone augmentation.

Intervention Use of bioactive glass as a bone graft substitute.

Comparator Autogenic bone grafts or other conventional grafting materials.

Study designs to be included Randomized controlled trials (RCTs), cohort studies, and case-control studies.

Eligibility criteria Included studies with quantitative bone healing assessments; excluded animal studies, non-English publications, and composites with mixed materials.

Information sources Five electronic databases (PubMed, Scopus, Web of Science, Cochrane, and Elsevier) and PROSPERO registration (CRDXXXXXX). **Main outcome(s)** Bone volume retention, new bone formation, resorption rate, and biomaterial retention.

Additional outcome(s) Complication rates, osseointegration, and overall clinical success.

Data management EndNote for screening, Excel for extraction, and PRISMA-guided systematic review.

Quality assessment / Risk of bias analysis Cochrane RoB2 for RCTs, ROBINS-I for nonrandomized studies, GRADE framework for evidence certainty.

Strategy of data synthesis Fixed/random-effects models standardized mean differences (SMD), and I² statistic for heterogeneity.

Subgroup analysis Not explicitly conducted; analysis focused on overall pooled estimates.

Sensitivity analysis Conducted using Duval and Tweedie's trim-and-fill method to address potential publication bias.

Language restriction Only articles in English.

Country(ies) involved Saudi Arabia.

Other relevant information Registered on PROSPERO, adhered to PRISMA and the Declaration of Helsinki, and excluded in vitro/ animal studies.

Keywords Bioactive glass, Autogenic bone graft, Maxillofacial reconstruction, New bone formation, Biomaterial retention.

Dissemination plans Findings intended for publication in peer-reviewed journals and clinical application guidelines; no specific conferences mentioned.

Contributions of each author

Author 1 - Mohammad Ali Saghiri -Conceptualization, Methodology, Software, Study design, Investigations, Resources. Email: mohammadali.saghiri@rutgers.edu Author 2 - Ravinder Saini - Formal analysis, Data

Curation, Supervision, Visualization, Project administration, Funding acquisition, Review and Editing.

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