INPLASY

"Xenogeneic bone block: Where are we now?" A systematic review and meta-analysis

INPLASY202450010
doi: 10.37766/inplasy2024.5.0010
Received: 03 May 2024
Published: 03 May 2024

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ADMINISTRATIVE INFORMATION

Support - None.

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

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202450030

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 03 May 2024 and was last updated on 03 May 2024.

INTRODUCTION

Review question / Objective To investigate the effectiveness of xenogeneic bone blocks on alveolar lateral bone augmentation.

Rationale The application of bone substitute blocks is poised for substantial future advancements. Consequently, the objective of this systematic review and meta-analysis is to evaluate and provide updated insights into the clinical outcomes of xenogeneic bone blocks. The key outcomes of interest include the extent of horizontal bone gain and the incidence of associated complications. Through this analysis, we aim to synthesize existing evidence and contribute to the optimization of bone regeneration strategies.

Condition being studied The PICO (population, intervention, comparison, and outcome) setting of the present systematic review included:

P: human adult participants (≥18 years old) received alveolar lateral bone augmentation;
I: Horizontal ridge augmentation with autogenous bone block;
C: Horizontal ridge augmentation with bone substitute block; and
O: Changes in horizontal bone thickness.

METHODS

Search strategy Two authors (H.-P.L. and S.-Y.C.) made independent electronic searches in the PubMed, Embase, and ClinicalTrials.gov with keyword of ('xenogeneic' OR 'xenograft' OR 'heterograft' OR 'bovine' OR 'porcine' OR 'equine') AND ('block') AND ('bone') AND ('reconstruction' OR 'augmentation' OR 'grafting') through the earliest record to March 1, 2024.

Participant or population Human participants.

Intervention Horizontal ridge augmentation with autogenous bone block.

Comparator Horizontal ridge augmentation with bone substitute block.

Study designs to be included Randomized controlled trials, prospective cohort studies, case series.

Eligibility criteria 1) randomized controlled trials (RCTs), prospective cohort studies, case series with sample size more than three 2) studies or case series investigating the quantitative evaluation of changes of horizontal bone thickness, 3) trials or case series with available data for baseline and follow-up measurement or in changes of horizontal bone thickness, 4) follow-up time equal or more than 3 months.

Information sources Two authors (H.-P.L. and S.-Y.C.) made independent electronic searches in the PubMed, Embase, and ClinicalTrials.gov with keyword of ('xenogeneic' OR 'xenograft' OR 'heterograft' OR 'bovine' OR 'porcine' OR 'equine') AND ('block') AND ('bone') AND ('reconstruction' OR 'augmentation' OR 'grafting') through the earliest record to March 1, 2024.

Main outcome(s) Changes in horizontal bone thickness after the grafting surgeries with xenogeneic bone blocks. In studies featuring two comparative arms, comparison of HBG was made between xenogeneic bone blocks and autogenous bone blocks.

Additional outcome(s) Horizontal bone resorption (HBR), Graft and implant survival rates. The secondary outcome evaluated in this investigation were horizontal bone resorption, graft and implant survival rates.

Data management Two independent authors, H-PL and S-YC, conduct the data extraction process for the reviewed studies. The process involved extracting demographic information, study design parameters, specific clinical characteristics of each study group, and the primary and secondary outcome values.

Quality assessment / Risk of bias analysis To investigate the methodological quality of recruited studies, we used the Cochrane risk-of-bias tool for randomized trials, version 2 (RoB 2), which consisted of 6 main items: randomization process, intervention adherence, missing outcome data, outcome measurement, selective reporting, and overall risk of bias. In the intervention adherence section of RoB 2, there are two options for literature assessment: intention-to-treat (intervention assignment) or per-protocol (intervention adherence). In this meta-analysis, we chose the per-protocol evaluation, since it fits the design of our included studies. For non-randomized trials, the Newcastle-Ottawa Scale (NOS) was applied to assess the quality and risks of the included studies.

Strategy of data synthesis The current meta-analysis was conducted with a random-effects model, using Comprehensive Meta-Analysis software, version 3 (Biostat, Englewood, NJ). A two-tailed p value less than 0.05 was considered statistically significant. We chose difference in means and 95% confidence intervals (CIs) to quantify the primary outcomes (changes in horizontal bone thickness). We chose odds ratios and their 95% CIs to investigate the secondary outcome (horizontal bone resorption, graft and implant survival rates).
The I2 and Cochran's Q statistics were used to evaluate the degree of heterogeneity among studies. An I2 value of 25%, 50%, and 75% was considered low, moderate, and high heterogeneity, respectively.

Subgroup analysis Subgroup analysis was not performed in this study.

Sensitivity analysis To confirm the robustness of the meta-analysis, the sensitivity analyses were performed using one-study removal method to see if there was a significant change in the summary effect size after removing a particular trial from the analysis.

Language restriction No language limit.

Country(ies) involved Taiwan.

Keywords Xenogeneic bone block, graft survival, implant survival, meta-analysis, systematic review.

Contributions of each author

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