INPLASY

Orthodontic Tooth Movement in Alveolar Bone Cleft Reconstruction with Beta-Tricalcium Phosphate: A Systematic Review of In vivo Evidence

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INTRODUCTION

Review question / Objective What impact does a bone graft of β-TCP have on ABC reconstruction during OTM?

Rationale Patients with ABC may be seen by orthodontists; these individuals are frequently treated with β-TCP as ABG material. Orthodontists may be concerned about how β-TCP as ABG may affect orthodontic tooth movement (OTM).

Condition being studied Alveolar bone clefts (ABC) reconstruction in an experimental animal model grafted with beta-tricalcium phosphate (β-TCP) and orthodontic tooth movement (OTM) application. ABC grafted for dentofacial reconstruction using β-TCP and OTM.

METHODS

Search strategy Web of Science/ISI-Web of Knowledge (https://www.webofscience.com/), Scopus (https://www.scopus.com/), MEDLINE/PubMed (https://pubmed.ncbi.nlm.nih.gov), and the Cochrane Library (https://www.cochranelibrary.com/advanced-search) were the databases that were searched. To augment the finished searches, manual searches were conducted. Additionally, the European System for Information on Gray Literature (http://www.opengrey.eu) and The New York Academy of Medicine Gray Literature Report (http://www.greylit.org) were used for screening of gray literature. Together with the electronic databases, the reference lists of the selected studies were also manually reviewed.

Participant or population Alveolar bone clefts (ABC) reconstruction in an experimental animal model grafted with beta-tricalcium phosphate (β-TCP) and orthodontic tooth movement (OTM) application.

Intervention ABC grafted for dentofacial reconstruction using β-TCP and OTM.

Comparator Histomorphometry, immunohistochemistry, HPA, radiography, and micro-computed tomography (μ-CT).

Study designs to be included Comparison studies, post-test-only control group design studies, cross-sectional studies, and real experimental laboratory investigations.

Eligibility criteria Research presenting pertinent information on the feasibility and/or accuracy of β-TCP bone grafting for ABC reconstruction with OTM involvement.

Information sources Original, open-access, full-text publications are accessible via IP access at Tohoku University Graduate School of Dentistry. Web of Science/ISI-Web of Knowledge (https://www.webofscience.com/), Scopus (https://www.scopus.com/), MEDLINE/PubMed (https://pubmed.ncbi.nlm.nih.gov), and the Cochrane Library (https://www.cochranelibrary.com/advanced-search) were the databases that were searched. To augment the finished searches, manual searches were conducted. Additionally, the European System for Information on Gray Literature (http://www.opengrey.eu) and The New York Academy of Medicine Gray Literature Report (http://www.greylit.org) were used for screening of gray literature. Together with the electronic databases, the reference lists of the selected studies were also manually reviewed.

Main outcome(s) OTM distance and OTM rate in Alveolar bone clefts (ABC) reconstruction in an experimental animal model grafted with beta-tricalcium phosphate (β-TCP).

Additional outcome(s) As described in point 18 [Main outcome(s)].

Data management There were two stages to the screening procedure. Using a standardized form in Microsoft Excel that had been tested before use, two reviewers independently assessed titles and abstracts for relevance in the first stage. Using the predetermined inclusion and exclusion criteria, full-text articles of possibly eligible studies were evaluated in the second step. A third reviewer was consulted to resolve disagreements. EndNote version 21.0 (Clarivate Analytics, US) was used to handle all references, and duplicates were eliminated before screening.

Quality assessment / Risk of bias analysis Each study was evaluated separately and independently by both investigators based on its kind. It was determined that the Animal Research: Reporting of In Vivo Experiments (ARRIVE) criteria would be used for the quality evaluation of in vivo experiments utilizing animal models. Discussions with the other reviewers resolved any disputes.

Strategy of data synthesis The two authors separately extracted the following data from the papers that satisfied the eligibility requirements using a pre-made extraction form: title, authors' names, year of publication, country, sample/subject or study group, alveolar cleft model and key findings. The PICO framework was used for extraction: Participants (P) include an experimental animal model undergoing bone grafting, ABC, β-TCP, and OTM involvement; intervention (I) includes bone grafting, ABC, and OTM involvement; comparison (C) includes standard examination techniques (histomorphometric, radiography or μ-CT, or immunohistochemistry); and outcomes (O) include OTM distance and OTM rate. From each study, information pertinent to the technique, sample size, length of the studies, and the investigations conducted were taken out. The two researchers separately used pre-established data-collecting forms to tabulate the results of the animal (in vivo) investigations in the table.

Subgroup analysis As mentioned in point 22 [Strategy of data synthesis].

Sensitivity analysis The risk of bias evaluation was carried out by a technique derived from prior systematic reviews. This assessment evaluated the description of several quality assessment parameters, including a well-defined β-TCP as a bone graft in ABC reconstruction with OTM involvement, standardized sample preparation, randomization of samples or subjects, tests conducted by a single-blinded operator, a clear test method specification, and comprehensive reporting of results. The article was labeled "Y" for a given parameter if the authors reported it and "N" if the information could not be located. The articles were classified as having a high, medium, or low risk of bias based on the number of "Y" elements included (1-2, 3-4, or 5-6), and their percentage was calculated.

Language restriction English.

Dissemination plans β-TCP has the potential to be osteoconductive but slows orthodontic tooth movement, reduces root resorption, and promotes the natural recovery of the ABC site. This in vivo evidence currently supports the potential clinical application of modified β-TCP for ABC reconstruction and suggests it may be suitable for use during OTM.

Contributions of each author
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