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Influence of bone level implant abutment contour on early peri-implant marginal bone loss and crestal bone remodeling: A systematic review and meta-analysis of randomized controlled trials

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ADMINISTRATIVE INFORMATION

Support - None.

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

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 31 May 2024 and was last updated on 31 May 2024.

INTRODUCTION

Review question / Objective To investigate the influence of abutment shape on early peri-implant marginal bone loss.

Rationale Studies promoting a gingival concave abutment or an abutment with a convergent or narrow shape allow more space for soft tissue growth and finally position soft tissue adhesion at a more coronal level, this migration could reduce peri-implant bone resorption. This was the goal of introducing abutments with convergent profiles as opposed to the classic divergent ones. However, the transition of a circumferential implant platform to the cervical anatomy is facilitated by the contour of the abutment. Therefore, to have enough knowledge to deal every clinical situation, we performed this systematic review and meta-analysis to investigate the effect of the shape of the abutment on peri-implant marginal bone loss.

Condition being studied The PICO (population, intervention, comparison, outcome) setting of the current meta-analysis included: (1) P: human participants undergone implant-supported restorations; (2) I: single implant restorations or implant-supported fixed partial dentures involving convex or wide abutments; (3) C: single implant restorations or implant-supported fixed partial dentures involving concave or flat abutments; and (4) O: changes in the peri-implant marginal bone level.

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 ("abutment shape" OR "abutment design" OR "abutment morphology" OR "concave abutment" OR "convex abutment" OR "abutment geometry") through the earliest record to Apr. 12, 2024.

Participant or population Human participants undergone implant-supported restorations.

Intervention Single implant restorations or implant-supported fixed partial dentures involving convex or wide abutments.

Comparator Single implant restorations or implant-supported fixed partial dentures involving concave or flat abutments.

Study designs to be included Randomized controlled trials.

Eligibility criteria To generate a recruited study list, the following inclusion criteria will be used: 1) randomized controlled trials (RCTs) enrolling human participants, 2) RCTs investigating the quantitative evaluation of peri-implant marginal bone loss, 3) trials with available data for baseline and follow-up measurement or in peri-implant marginal bone loss, 4) studies use bone level implants, 5) 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 ("abutment shape" OR "abutment design" OR "abutment morphology" OR "concave abutment" OR "convex abutment" OR "abutment geometry") through the earliest record to Apr 12, 2024.

Main outcome(s) The primary outcomes were the assessing changes in marginal bone levels following the utilization of single implant restorations or implant-supported fixed partial dentures involving convex or wide abutments compared to those involving concave or slim abutments.

Additional outcome(s) The secondary outcome evaluated in this investigation was pink esthetic scores. Additionally, our evaluation encompassed an examination of changes in crestal bone levels.

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.

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 peri-implant marginal bone level). We chose difference in means and 95% CIs, odds ratios and their 95% CIs to investigate the secondary outcome (changes of crestal bone level and pink esthetic score).
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 analyses based on platform design, presence of smooth collar, and abutment emergence angle were performed.

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 Abutment shape, abutment design, randomized, clinical trials, meta-analysis, systematic review.

Contributions of each author

Author 1 - Sieu Yien Chiam - Author 1 drafted the manuscript.
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