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ORIGINAL ARTICLE

Effects of tooth extraction on smile esthetics and the buccal corridor: A meta-analysis

Hsin-Chung Cheng ^{a,b,*}, Yi-Chun Wang ^{a,b}, Ka-Wai Tam ^{c,d,e},
Ming-Fang Yen ^f

^a School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan, ROC

^b Department of Dentistry, Taipei Medical University Hospital, Taipei, Taiwan, ROC

^c Department of Surgery, Taipei Medical University—Shuang Ho Hospital, New Taipei City, Taiwan, ROC

^d Department of Surgery, School of Medicine, College of Medicine, Taipei Medical University, Taiwan, ROC

^e Center for Evidence-based Medicine, Taipei Medical University, Taipei, Taiwan, ROC

^f School of Oral Health, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan, ROC

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KEYWORDS

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Abstract *Background/purpose:* Smile esthetics is a critical factor for evaluating orthodontic treatment outcomes. The effects of tooth extraction on smile esthetics and buccal corridor remain controversial and have not been adequately investigated. Therefore, in this systematic review and meta-analysis, we evaluated the aforementioned effects.

Materials and methods: We searched clinical studies held in PubMed, MEDLINE, Embase, and the Cochrane Library up to May 2015, with no restriction. Study selection and data extraction were conducted by two reviewers independently. A random-effects model was used for conducting a meta-analysis to assess the mean difference between the esthetic score and the buccal corridor ratio of extraction and nonextraction groups.

Results: Six eligible studies were included in this meta-analysis. No significant difference was observed in the esthetic score and the buccal corridor ratio between extraction and nonextraction groups.

Conclusion: Tooth extraction does not affect smile esthetics or buccal corridor. However, additional detailed, large-scale, double-blinded, and randomized controlled trials are required for further evaluation.

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* Corresponding author. School of Dentistry, College of Oral Medicine, Taipei Medical University, Number 250, Wuxing Street, Xinyi District, Taipei City 110, Taiwan, ROC.

E-mail address: g4808@tmu.edu.tw (H.C. Cheng).

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Introduction

Smile esthetics has gained increased attention in orthodontic treatments because orthodontic patients now evaluate treatment outcomes not only on the changes of their facial profile, but also their smiles. However, most orthodontic studies emphasize lateral skeletal analysis rather than frontal smile esthetics.

Smile esthetics is associated with multiple factors, including the dentition and surrounding soft tissue. One of the essential factors of smile esthetics is the presence or absence of a buccal corridor.¹ The buccal corridor is defined as the space between the facial surfaces of the posterior teeth and the corners of the lips during smiling.² It remains unclear whether the buccal corridor should be measured according to the canines or to the last visible teeth, but previous studies have revealed an association between buccal corridor and smile esthetics. Some authors suggested that the presence or absence of a buccal corridor while smiling is not esthetically critical,³ whereas some claim that smiles with a larger buccal corridor are less esthetically pleasing.^{4–9}

Tooth extraction is common in orthodontic treatments. Some studies report that the arch width is not necessarily narrower in patients with tooth extraction.^{10,11} However, others say that extraction may lead to constriction of the dental arches and reduced fullness of the dentition while smiling, resulting in an increased buccal corridor that can affect smile esthetics.^{12,13}

The effects of tooth extraction on smile esthetics and the buccal corridor remain unclear; therefore, we conducted a systematic review and meta-analysis to analyze these effects.

Materials and methods

Selection criteria

We included clinical studies that fulfilled the following criteria: (1) compared smile esthetics between patients who did and did not undergo tooth extraction; (2) used post-treatment frontal smiling photos for grading; (3) considered all permanent dentitions; and (4) used fixed appliance for orthodontic treatments.

Studies were excluded from our meta-analysis for the following reasons: (1) the outcomes of interest were not clearly reported; (2) different comparison settings were used; (3) different outcome measurements were used; and (4) there was an overlap among authors, centers, and patients across published studies.

Search strategy and study selection

Studies were identified by conducting a computerized search of four databases, namely PubMed, MEDLINE, Embase, and the Cochrane Library, from their inception until May 2015. The following combination of keywords was used: extraction OR removal, esthetic OR esthetics OR smile OR attractive, and orthodontic OR orthodontics. We reviewed all retrieved abstracts, studies, and citations

and identified additional studies by searching the references of relevant studies; no language restrictions were applied.

Data extraction

Two reviewers (Y.C.W. and C.L.C.) independently extracted the following information from each study: first author, year of publication, study design, total patients in each group, study population characteristics, and intervention and outcome methods. The individually recorded decisions made by the two reviewers were compared, and any disagreement was resolved by another reviewer (H.C.C.).

Outcome assessments

The primary outcome of this meta-analysis was the esthetic score of the patients. The secondary outcome was the buccal corridor ratio, which was further represented as intercanine width relative to smile width, and last visible teeth width relative to smile width.

Statistical analysis

Review Manager (version 5.3; Cochrane Collaboration, Oxford, England) was used to conduct the analysis. The meta-analysis was performed according to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-analyses.¹⁴ When necessary, standard deviations were estimated from the provided confidence interval (CI) limits, standard errors, or range values.¹⁵ A random-effects model was used for assessing the esthetic score of the extraction and nonextraction groups. The effect sizes of continuous outcomes were reported as the mean difference¹⁶; the precision of an effect size was reported as 95% CI. Furthermore, statistical heterogeneity was assessed using the I^2 test, in which $I^2 \geq 50\%$ defined substantial heterogeneity. Because the data on buccal corridor reported by one study¹⁷ were different from those in the other included studies, we performed a separate sensitivity analysis to eliminate the outlier data, thereby minimizing possible bias.

Results

Study characteristics

Figure 1 shows the flow chart describing the study selection. The search strategy detailed in the Materials and methods section yielded 724 citations. Of these, 706 citations were excluded because they were not clinical studies, were on a different topic, or were duplicated. We thus retrieved the full text of 18 manuscripts, and 12 were then excluded from the final review. Of these, 10 studies were excluded because different methodologies were used, including methodologies where the esthetic score was not evaluated while comparing the extraction and non-extraction groups,^{18–24} and others where the esthetic score was evaluated from the lateral, not the frontal view.^{25–27}

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