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Major approaches and clinical outcomes of gingival correction procedures for improved aesthetic smile: a concise systematic review

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Abstract

Introduction: Well-being is directly related to health, people with a balanced smile, between health and beauty, tend to smile more and this generates a condition of wellbeing. A small gingival plastic can modify the smile as a whole, also changing the other variables. In gingival correction, process-specific techniques are used for each case, thus individualizing the patient and the proposed treatment. **Objective:** It was to present a concise systematic review of the main approaches and clinical outcomes of gingival correction procedures to achieve the best aesthetic smile. **Methods:** The PRISMA Platform systematic review rules were followed. The search was carried out from August to September 2024 in the Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument. **Results and Conclusion:** 68 articles were found and 20 articles were evaluated in full and 08 were included and developed in the present systematic review study. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 15 studies with a high risk of bias and 21 studies that did not meet GRADE and AMSTAR-2. Most studies did not show homogeneity in their results, with X^2=89.6%>50%. It was concluded that a gummy smile consists of the visualization of more than 3 mm of gum above the maxillary incisors. For the success of an aesthetic correction, one must be aware of the causes of the change in normality, added to the patient's reasons. The ideal planning is when post-surgical effects directly influence cause removal and patient satisfaction, which is in line with our research results. Digitally assisted esthetic crown lengthening helps to shorten the operation time and reduces the possibility of human errors during measurements. This will be useful to help professionals achieve better results.

Keywords: Aesthetics. Gingival aesthetics. Gingivoplasty. Surgery.

Introduction

Well-being is directly related to health, people with a balanced smile, between health and beauty, tend to smile more and this generates a condition of well-being. Currently, the demand for medical and dental procedures for aesthetic purposes has increased significantly, which keeps us active in the search for less invasive and longerlasting techniques [1,2].

The variables that can be altered for a smile aesthetic balance conditioning are tooth color, tooth size, shape, dental positioning, and soft tissues of the face and mouth, these are lips, and the gum. A small gingival plastic can modify the smile as a whole, also changing the other variables [3,4].

In gingival correction, process-specific techniques are used for each case, thus individualizing the patient and the proposed treatment, correcting not only the aesthetics but also the patient as a whole. The smile becomes aesthetically pleasing when the lips, teeth,

and gum are arranged in proper proportion, and the exposure of the gingival tissue is limited to 3 mm. When gingival exposure is greater than 3 mm, a non-aesthetic condition called gingival smile is characterized [4-7].

In this sense, periodontics is the specialty of dentistry that assists in smile correction, acting on the manipulation of gingival tissues, and creating harmony between lips and gum. The gingival smile may have different etiologies as hypermobility of the upper lip elevator muscles; pronounced vertical jaw growth; upper dentoalveolar extrusion; thin upper lip and gingival hyperplasia [8-10].

Thorough planning and the correct diagnosis of the cause of gum smile directly influence the success of the proposed treatment and the longevity of the results. To treat the harmony of the patient's smile, we sought the cause of the gum smile to perform precise planning to remove the causes and balance the effects. For this, a thorough literature search was performed on the techniques used to correct the gingival smile, the gingivectomy technique followed by flap elevation and ostectomy/osteoplasty were selected [1-4].

Therefore, the present study presented a concise systematic review of the main approaches and clinical outcomes of gingival correction procedures to achieve the best aesthetic smile.

Methods

Study Design

The present study followed the international systematic review model, following the rules of PRISMA (preferred reporting items for systematic reviews and meta-analysis). Available at: http://www.prisma-statement.org/?AspxAutoDetectCookieSupport=1. Accessed on: 09/18/2024. The methodological quality standards of AMSTAR-2 (Assessing the methodological quality of systematic reviews) were also followed. Available at: https://amstar.ca/. Accessed on: 09/18/2024.

Data Sources and Research Strategy

The literary search process was carried out from August to September 2024 and was developed based on Scopus, PubMed, Web of Science, Lilacs, Ebsco, Scielo, and Google Scholar, covering scientific articles from various to the present. The health science descriptors (DeCS/MeSH Terms) were used: *"Aesthetics. Gingival aesthetics. Gingivoplasty. Surgery"* and using the Boolean "and" between the MeSH terms and "or" between historical discoveries.

Study Quality and Risk of Bias

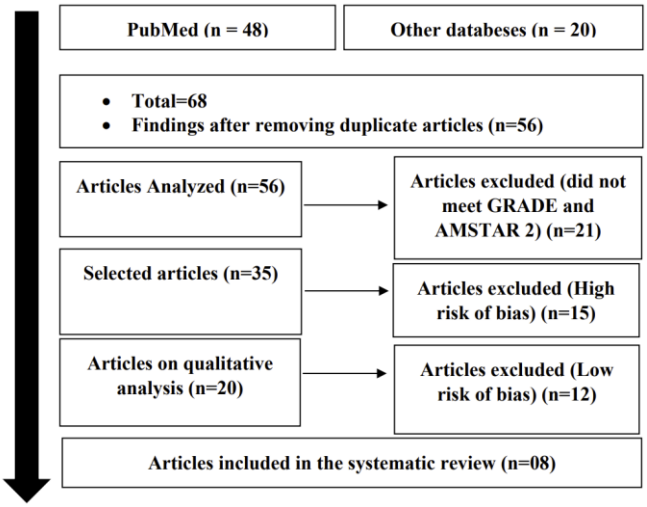
Quality was classified as high, moderate, low, or very low in terms of risk of bias, clarity of comparisons, precision, and consistency of analyses. The most evident emphasis was on systematic review articles or meta-analyses of randomized clinical trials, followed by randomized clinical trials. The low quality of evidence was attributed to case reports, editorials, and brief communications, according to the GRADE instrument. The risk of bias was analyzed according to the Cochrane instrument by analyzing the Funnel Plot graph (Sample size versus Effect size), using the Cohen test (d).

Results and Discussion

Summary of Findings

A total of 68 articles were found that were subjected to eligibility analysis, with 08 final studies being selected to compose the results of this systematic review. The studies listed were of medium to high quality (Figure 1), considering the level of scientific evidence of studies such as meta-analysis, consensus, randomized clinical, prospective, and observational. The biases did not compromise the scientific basis of the studies. According to the GRADE instrument, most studies showed homogeneity in their results, with X^2=89.6%>50%. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 15 studies with a high risk of bias and 21 studies that did not meet GRADE and AMSTAR-2.

Figure 1. The article selection process by the level of methodological and publication quality.

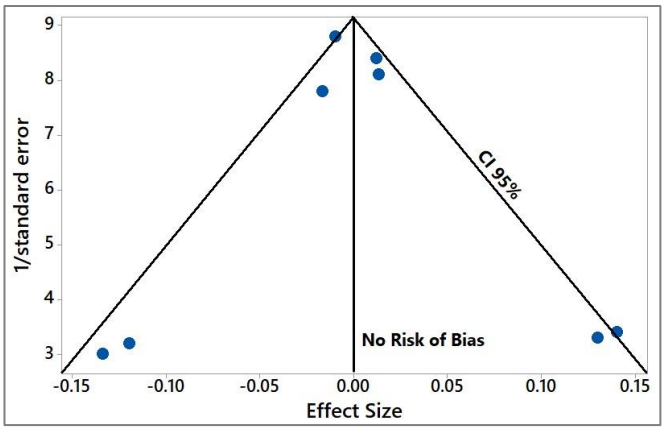


Source: Own authorship.

Figure 2 presents the results of the risk of bias of the studies using the Funnel Plot, showing the calculation of the Effect Size (Magnitude of the difference) using the Cohen Test (d). Precision (sample

size) was determined indirectly by the inverse of the standard error (1/Standard Error). This graph had a symmetrical behavior, not suggesting a significant risk of bias, both between studies with a small sample size (lower precision) that are shown at the bottom of the graph and in studies with a large sample size that are presented at the top.

Figure 2. The symmetric funnel plot suggests no risk of bias among the small sample size studies that are shown at the bottom of the graph. High confidence and high recommendation studies are shown above the graph (n=08 studies).



Source: Own authorship.

Clinical Outcomes – Gingival Aesthetic Correction

For the success of an aesthetic correction, one must be aware of the causes of the change in normality, added to the patient's reasons [11]. Suber et al. [12] suggest that before any aesthetic correction, the patient's and dentist's thoughts should be clearly aligned so as not to entertain hopes about postoperative outcomes.

The ideal planning according to Kane et al. [10] is when post-surgical effects directly influence cause removal and patient satisfaction, which is in line with our research results. For successful planning the patient's age should always be taken into account, for patients over 45 years the lips become hypotonic, and for correction of gingival exposure caused by contraction of the upper lip elevator muscles, so this is always postoperative relapse. To be considered, associated with age should also be observed in the patient's facial profile, those with long faces are susceptible to prolonged maintenance of a gingival smile and less invasive techniques are not fully recommended [13].

Based on this example, Figures 1 to 6 show the stages of the surgical procedure of a young patient who belongs to the authors of the present study. The Figures show the before, during, immediate after, and 30 days of the gingival correction surgical process. These results demonstrate the aesthetic success of this procedure.

Figure 1. Shape and size of the clinical crowns of the upper anterior elements and gingival zenith lines.

Figure 2. Planning of surgery on the elements and marking of the surgical gingival zenith.

Figure 3. Clinical crown and gingival contour of element 11 immediately after correction of the gummy smile.

Figure 4. Clinical crowns and gingival contour of teeth 11 to 15 immediately after correction of the gummy smile.

Figure 5. Immediate post-operative period.

Figure 6. 30 days post-operative period.

In this context, excessive gingival display (EGD) is defined as more than 2 mm of gingival display above the maxillary incisors. A recent study by Maleki et al. (2024) [14] evaluated the efficacy and stability of surgical (SX) and non-surgical (NSX) interventions for EGD correction through a systematic review and meta-analysis. The results were expressed as mean change in gingival display using the random-effects model at 1, 3, 6, and 12 months of follow-up. At 1 month, SX and NSX treatments produced a comparable mean reduction of 3.50 mm (2.13–4.86) and 3.43 mm (2.67–4.19) in the gingival display, respectively. However, at 6 months, NSX treatments showed a reduction of 0.51 mm compared with 2.86 mm with SX treatments. SX results remained stable after 6 months, whereas NSX results partially relapsed at 6 months and returned to baseline levels at 12 months. Furthermore, gingival hyperpigmentation resulting from physiological melanosis causes aesthetic discomfort. A clinical case study showed a surgical procedure combining gingivectomy with gingivoplasty for the treatment of physiological melanosis. The surgical procedure was performed on a 40-year-old female patient with bilateral pigmentation in both arches. The results of the histological analysis confirmed the diagnosis of melanotic macule, with papillary hyperplasia and cytopathic changes suggestive of HPV infection, which was verified using an immunohistochemical analysis based on the detection of an important HPV capsid protein. Acceptable functional and aesthetic results were obtained for the patient without major discomfort during the postoperative period.

A clinical study by Xu et al. (2024) [15] analyzed layperson's aesthetic perception of combined images of smile lines and upper lip. A total of 26 smile images resulting from combinations of 3 upper lip types, 4 anterior smile line types, and 3 posterior smile line types were generated by an image editing software program. A total of 83 laypersons (39 men and 44 women; 18–35 years of age) completed image rating using a visual analog scale. Unattractive smiles were designated as those with scores <50 and attractive smiles with scores ≥50. The high anterior smile line with gingival display >4 mm scored significantly lower than <50 when combined with all upper lip curvatures (upward: 28.29 ±22.79, straight: 38.74 ±23.00, downward: 30.67 ±22.25, p<.01). The high anterior smile lines with gingival display ≤4 mm combined with images of upper lip curvature up and down scored significantly higher, and all were ≥50 (upward: 63.24 ±22.22, straight: 61.40 ±21.58, P<.01).

Since it is known that a gummy smile consists of the visualization of more than 3 mm of gingiva above the maxillary incisors, the authors Angulo-Manzaneque et al. (2024) [16] evaluated the long-term effects on esthetics and patient satisfaction of a new hyaluronic acid infiltration technique in reducing gummy smile. A total of 50 patients with gummy smiles were treated using hyaluronic acid infiltration points by applying 0.1 mL per injection at specific points. Post-treatment evaluations were performed one week, one month, three months, six months, and 12 months later. A questionnaire assessed patient satisfaction, willingness to recommend the treatment, and side effects (pain and bruising during and after treatment). An average reduction of 2.5 mm in gingival display during smiling was observed. After one week, the reduction was constant. At six months, 40% of the original gingival display was recovered, and recovery was complete at 12 months. Patient satisfaction was 82.1%, and 100% of patients would recommend the treatment. Bruising, swelling, and pain decreased to 0% from the first month.

Finally, surgical guides have been proposed in an attempt to achieve more predictable results for esthetic crown lengthening. Authors Borham et al. (2024) [17] evaluated the efficacy of esthetic crown lengthening using 3D-printed surgical guides in the treatment of excessive gingival display due to altered passive eruption type 1B. A total of 16 patients diagnosed with altered passive eruption type 1B were divided into two groups. In the control group, the procedure was performed conventionally, and in the study group, a double surgical guide was used. The results showed that there was no statistically significant difference in terms of wound healing, pain scores, and gingival margin stability between both groups at different time intervals; however, there was a statistical difference between both groups in terms of operation time, with the study group being significantly shorter.

Conclusion

It was concluded that a gummy smile consists of the visualization of more than 3 mm of gum above the maxillary incisors. For the success of an aesthetic correction, one must be aware of the causes of the change in normality, added to the patient's reasons. The

ideal planning is when post-surgical effects directly influence cause removal and patient satisfaction, which is in line with our research results. Digitally assisted esthetic crown lengthening helps to shorten the operation time and reduces the possibility of human errors during measurements. This will be useful to help professionals achieve better results.

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The authors declare no conflict of interest.

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