



Minimally Invasive Correction of a Gummy Smile Through Digital Smile Designing and Diode LASER-Assisted Crown Lengthening: A Case Report

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 25 Nov 2023	<p>A gummy smile, defined as the visibility of more than 3 mm of gingival tissue during a smile, is one of the most common reasons for an unaesthetic smile. The advent of digital smile designing (DSD) marks a paradigm shift in smile enhancement. Leveraging digital editing software and photography, DSD offers a user-friendly platform for treatment planning and patient communication. The present case report details the diagnosis and treatment of a patient with unaesthetic anterior teeth and a gummy smile, utilizing a multidisciplinary approach that integrates DSD and a minimally invasive gingivectomy procedure. The dynamic nature of DSD, enabling clinicians to showcase the proposed results on a computer, enhances communication with patients and fosters a shared understanding of treatment objectives</p>
CC License CC-BY-NC-SA 4.0	Keywords: Aesthetics; Crown Lengthening Procedure; Golden Proportion

1. Introduction

The smile, a quintessential aspect of human expression, holds immense social significance, influencing an individual's confidence and interpersonal interactions. It involves a favorable orchestration of teeth, lips, and gingiva; the optimal visibility of each of these components during a smile holds a great influence on its aesthetics. Therefore, designing an optimal smile can enhance an individual's overall well-being in which the treatment plan determined by dental professionals plays a pivotal role.^[1] In this context, aesthetic dentistry is the ever-evolving and highly valued frontier of dentistry that has gained prominence over the past few decades.

A gummy smile, defined as the visibility of more than 3 mm of gingival tissue during a smile, is one of the most common reasons for an unaesthetic smile.^[2] It can result from a spectrum of factors such as gingival enlargement, incomplete passive eruption, short lips, hyperactive lip muscles, and maxillary protrusion. Addressing the issue requires a nuanced understanding of gingival tissues during esthetic corrections and therefore, precise diagnosis becomes imperative before implementing the corrective measures. If excessive gingival display is attributed to gingival excess, a strategic plan involving gingivectomy or crown lengthening may be instituted. Crown lengthening, a procedure aimed at enhancing supragingival tooth structure for restorative or esthetic purposes, is often executed using surgical blades, electrosurgery, or lasers.^[3]

The symbiosis of esthetics and function is paramount in smile design, ensuring enduring restorations and heightened patient satisfaction. Inadequately executed esthetic and restorative procedures can compromise the health of soft and hard tissues, emphasizing the importance of minimally invasive

treatment protocols to preserve healthy tooth structure.^[4] Evaluation of available treatment options and techniques is crucial to achieving optimal clinical outcomes without compromising patient health. One such option gaining traction is the use of soft-tissue diode lasers for gingival tissue management.

The advent of digital smile designing (DSD) marks a paradigm shift in smile enhancement. Leveraging digital editing software and photography, DSD offers a user-friendly platform for treatment planning and patient communication. It provides digital simulations, allowing patients to visualize potential outcomes and facilitating treatment acceptance.^[5] The present case report details the diagnosis and treatment of a patient with unaesthetic anterior teeth and a gummy smile, utilizing a multidisciplinary approach that integrates DSD and a minimally invasive gingivectomy procedure. The comprehensive nature of this approach aims to contribute valuable insights to the evolving perspectives of esthetic dentistry, emphasizing the importance of precise diagnosis, innovative treatment planning, and patient-centered care.

Case Report:

A 32-year-old female presented to the Department of Prosthodontics, D. Y. Patil University, School of Dentistry, Nerul, Navi Mumbai, with a chief complaint of unaesthetic anterior teeth and a gummy smile. The patient expressed discontent with her smile and sought a permanent solution. A detailed examination revealed a small clinical crown, emphasizing the need for a comprehensive esthetic intervention (Figure 1). The patient's periodontal status was within normal limits, and her medical history was unremarkable. The initial examination highlighted the absence of the cementoenamel junction clinically, leading to the diagnosis of delayed passive eruption. This crucial insight directed the focus towards a periodontal rather than a dental etiology, necessitating a unique treatment approach.

Figure 1: Pre-operative frontal view of the A) Smile and B) teeth in occlusion



To address the patient's concerns effectively, a treatment plan was devised for anterior smile designing between the maxillary first premolars bilaterally, acknowledging the wide smile. The DSD protocol was chosen to provide a systematic and visually intuitive framework for treatment planning. Utilizing DSD software, a comprehensive smile assessment was conducted, revealing a 5 mm gingival exposure during smiling. Further esthetic evaluation, including facial analysis, demonstrated no midline discrepancy. The patient's lip length was found to be average, and the incisal edges of the anterior teeth exhibited no signs of wear. This collective information led to the conclusion that the gummy smile was dentogingival, indicating a periodontal rather than skeletal origin.

Once the etiology was established, the DSD software was employed to project the expected outcome (Figure 2). Gingival level, tooth form, and contour were meticulously evaluated for each tooth using Keynote version 2.6.2. Applying the principles of the golden proportion, the dimensions of the central incisors, lateral incisors, and canines were determined, ensuring optimal harmony. Subsequently, the treatment plan involved a minimally invasive gingivectomy guided by the Galip Gürel's Technique.^[6] The golden proportion principles were adapted within the software to achieve the desired tooth proportions. These measures were then transferred to a stone cast for an appropriate wax-up.

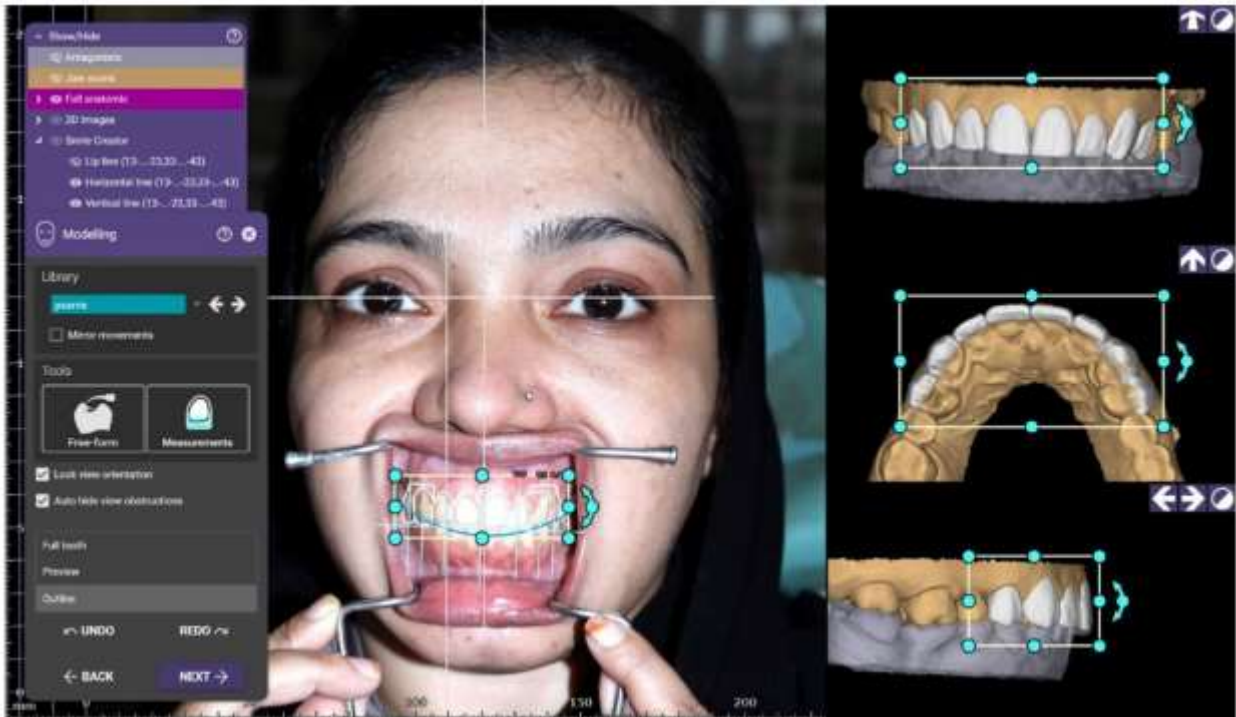


Figure 2: Digital Slide Designing software used to comprehensively assess the smile and project the expected outcome

The gingival portion of the wax-up was duplicated in clear acrylic resin, creating a mock-up that served as a stent for precise gingivectomy. With the patient's esthetic approval, the gingivectomy was performed, guided by the contour of the clear acrylic stent (Figure 3). Notably, post-operative clinical examination confirmed normal periodontal status, highlighting the success of the periodontal intervention. A provisional restoration, aligned with the planned mock-up, was crafted using aesthetic pre-evaluative temporaries following Galip Gürel's method for veneers. The gingival retraction was performed, and immediate bis-acrylic provisional restorations were placed following impressions.



Figure 3: A) Crown lengthening guide using Golden Proportion; B) Post-Crown lengthening procedure with laser

The patient was discharged with the provisional restorations, and instructed to evaluate them for appearance and comfort. With the patient's approval, the final restorations were fabricated using Lithium disilicate and bonded with Vario link, completing the comprehensive aesthetic transformation (Figure 4 and 5).



Figure 4: A) Provisionalization post crown lengthening procedure; B) Shade selection; Post-operative smile in C) Frontal, D) Lateral and E) Occlusal view

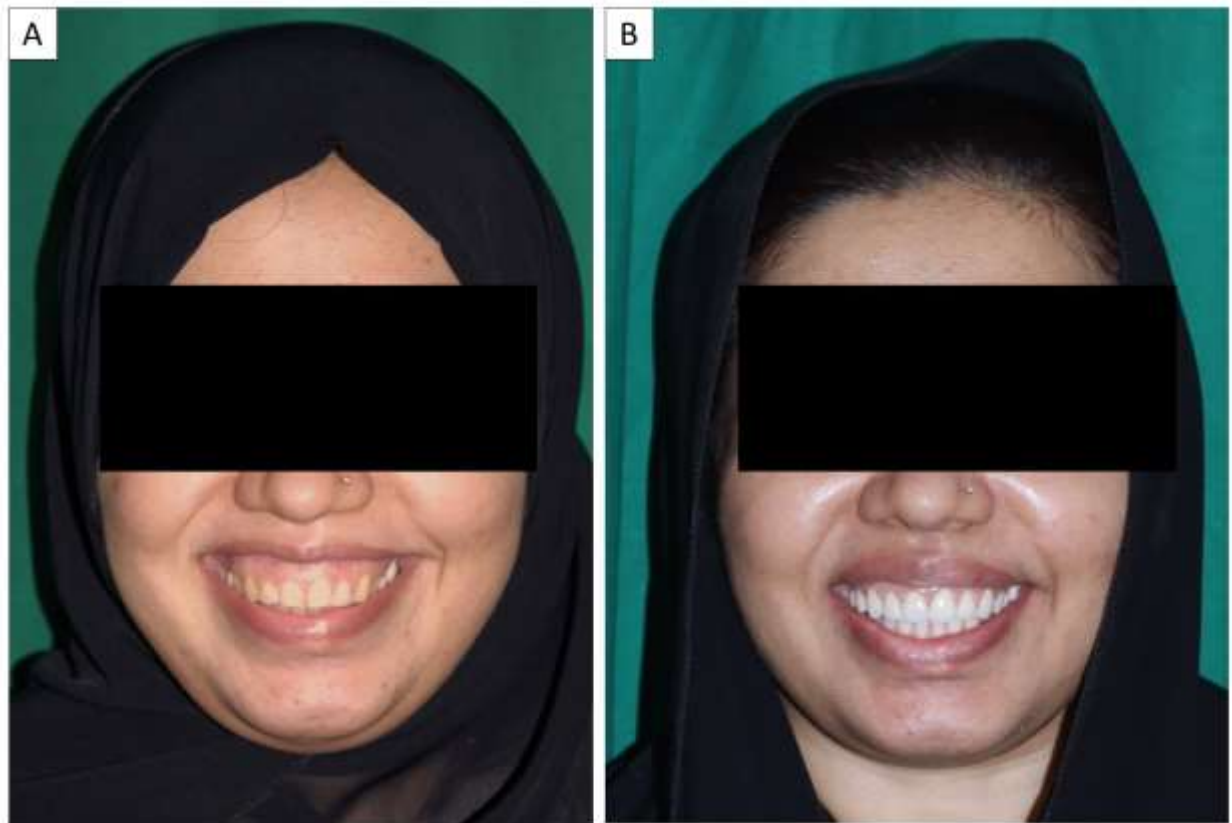


Figure 5: Comparison of A) Pre-operative vs B) Post-operative smile

Discussion:

The present case report exemplifies a meticulous and comprehensive approach to correcting a gummy smile, intertwining DSD with a minimally invasive gingivectomy procedure. The entire treatment protocol was underpinned by a scientific rationale, ensuring both optimal esthetic outcomes and the preservation of periodontal health. Accurate diagnosis forms the bedrock of any successful esthetic intervention. In this case, the patient's dissatisfaction with her smile and small clinical crown prompted

a thorough examination, revealing delayed passive eruption. The absence of the cemento-enamel junction clinically guided the diagnostic process, emphasizing the importance of distinguishing between dental and periodontal etiologies.^[7]

The Integration of DSD played a pivotal role in the treatment planning phase, providing a dynamic platform for a systematic evaluation of various esthetic parameters. This innovative approach allowed for the visualization and communication of the treatment plan to the patient.^[5] Scientifically, DSD facilitated the achievement of optimal proportions based on the golden proportion principles, ensuring a harmonious and natural-looking smile.

The decision to perform a gingivectomy was influenced by the patient's gummy smile attributed to delayed passive eruption. The Galib Gureils Technique, chosen for its minimally invasive nature, was employed to preserve healthy tooth structure while addressing the esthetic concern.^[6] Scientifically, this technique facilitates precise gingival contouring, guided by the clear acrylic stent, resulting in an optimal gingival architecture. The philosophy of minimally invasive dentistry underpinned the entire treatment process, from smile analysis to gingivectomy and provisional restorations.^[4] Preservation of healthy tooth structure is paramount for long-term success in esthetic dentistry. Scientifically, minimizing the loss of enamel and dentin helps maintain the integrity of the tooth and reduces the risk of post-operative sensitivity.

The creation and placement of provisional restorations served multiple purposes, allowing the patient to preview the anticipated outcome and ensuring the feasibility and comfort of the proposed final restorations. From a scientific standpoint, provisional restorations act as a diagnostic tool, aiding in the assessment of esthetics, occlusion, and patient satisfaction before the final restorations are fabricated. The choice of Lithium disilicate for the final restorations is rooted in its favorable mechanical properties, including high flexural strength and excellent esthetics.^[8] The material provides a durable and aesthetic solution, essential for long-term success in anterior restorations.

The bonding of the final restorations using Vario Link ensures a reliable and stable adhesion between the restorations and the tooth structure.^[9] The choice of a reputable bonding agent is crucial for the longevity and success of restorative procedures. Characteristically, Vario Link offers a strong bond, contributing to the overall structural integrity of the restoration.^[10]

Throughout the treatment process, a patient-centered approach was maintained. Overall, the amalgamation of scientific principles, cutting-edge technology, and a patient-centered approach culminated in a successful correction of the gummy smile. This comprehensive approach not only addresses the immediate cosmetic concerns of the patient but also sets a foundation for long-term satisfaction and functional harmony.

4. Conclusion

The present case report illustrates that achieving long-term esthetic success in patients with a gummy smile is contingent upon precise diagnosis and meticulous treatment planning. The incorporation of DSD emerges as a transformative tool in this process, as it not only comprehensively analyzes facial and dental features but also facilitates a visual representation of the desired outcome. The dynamic nature of DSD, enabling clinicians to showcase the proposed results on a computer, enhances communication with patients and fosters a shared understanding of treatment objectives. Furthermore, the collaborative integration of DSD with lasers represents a pioneering stride in esthetic dentistry. This synergy enables clinicians to transcend traditional boundaries, offering a novel approach that merges digital precision with minimally invasive techniques.

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