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## RESEARCH ARTICLE

# GINGIVOPLASTY WITH THE AID OF DIGITAL TOOLS IN THE CORRECTION OF THE GINGIVAL SMILE

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### ABSTRACT

**Purpose:** To report a case of gummy smile correction through periodontal plastic surgery with the aid of digital tools for planning and diagnosis. **Case report:** To obtain an accurate diagnosis, a complete and individualized diagnostic evaluation is necessary to identify which treatment is most suitable for each patient. With the evolution of technology in contemporary dentistry, these tools have become indispensable for the correction of the red aesthetics of the smile, especially about communication between the dentist and the patient. **Conclusion:** Thus, the use of technologies for digital diagnosis provided greater predictability of results and surgical precision, leading to a positive impact on the patient's quality of life in the postoperative period and satisfaction with her smile.

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## INTRODUCTION

The appearance of the smile is an important element for the establishment of interpersonal relationships, being one of the main physical characteristics present within communication, being able to express feelings of joy, courtesy, sensuality, sympathy and self-confidence. However, the disharmonious presentation of this set: teeth, gums and lips, negatively influence the aesthetic and psychological issue of the individual, which can lead to psychological disorders and isolation from social life (Mostafa, 2018). Currently, periodontal aesthetics have been increasingly valued, since the amount of gingival exposure directly influences the harmony of the smile. When there is this exposure of gingival tissue exceeding 2 mm, it is considered the condition of gummy smile (GS), being a common alteration that affects men and women (Mostafa, 2018). The gummy smile may be linked to muscular, gingival, skeletal and dental factors, or a combination of these. The main etiological factors stand out: hyperactivity of the upper lip; short clinical crown; upper lip dimension; altered passive eruption; vertical maxillary excess; and gingival hypertrophy (France, 2020). A detailed and meticulous analysis of the smile should serve as a parameter for the result of the etiological diagnosis, in which it will be essential to define in the choice of treatment. In addition to the etiology, other factors are also considered important in the choice of therapy. Treatment alternatives include orthodontic, periodontal and surgical therapies, depending on the characteristics of the GS (Galdino, 2021).

Through the new technologies used in dentistry, we can have greater precision in planning the patient's future smile, where such tools make it possible to determine in the digital environment, the most appropriate treatment to obtain more satisfactory results and anticipate the visualization of results, on the part of the patient and the professional, before starting the treatment itself. Among the surgical techniques, gingivectomy stands out, which consists of removing the height of the inserted gingiva, aiming at the correction of the soft tissue around the anterior dental elements, resulting in the increase of the clinical crown and improving the harmony of the smile.

## CASE REPORT

Leucoderma patient JSA, female, 29 years old, attended the teaching clinic of the Centro Universitário da Amazônia (UNIFAMAZ), complaining of excessive gingiva when smiling and aesthetics of the anterior teeth. After signing the Informed Consent Form (TCLE), the patient was submitted to a clinical periodontal examination, where it was possible to observe an anatomical discrepancy between the length of the teeth 11, 12, 13, 14, 15, 21, 22, 23, 24 and 25 in addition to 4 mm of gingival exposure during smiling, characterizing the gummy smile condition (Figures 1 and 2). During the anamnesis, the patient reports that she is not a smoker and does not drink alcohol, in addition to not having any systemic complications, and not making continuous use of medication. Through clinical evaluation, it was possible to identify periodontal tissues of healthy supports, with absence of

loss or any alteration in the supporting periodontium in complementary radiographic examinations (Figures 3 and 4). Based on this detailed assessment, the combination of altered passive eruption and hyperactivity of the upper lip elevator muscles was diagnosed as etiological factors for gummy smile in this clinical case.



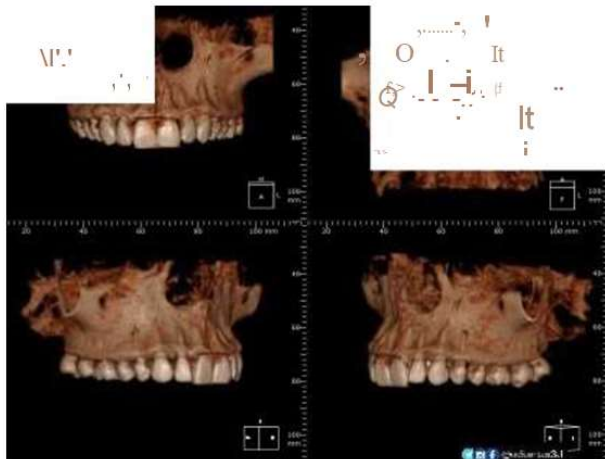
Source: Own authorship.

**Figure 1. Front view of the patient**



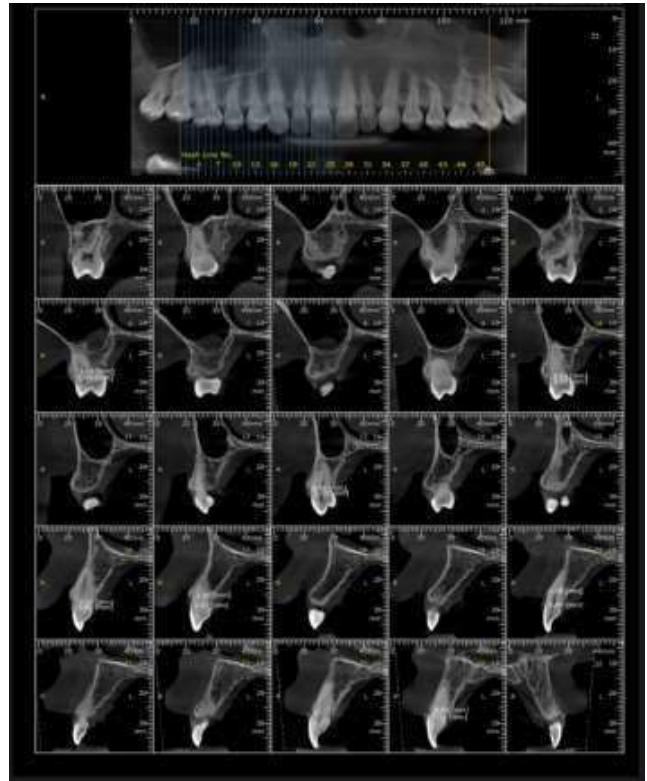
Source: Own authorship.

**Figure 2. Side view of the patient**



Source: Own authorship.

**Figure 3. Computed tomography**



Source: Own authorship.

**Figure 4. Computed tomography**

After observing a good condition of periodontal health, the patient's surgical planning was initiated (Figure 5). The requested exams included: computed tomography, intraoral scanning, photographic and video protocol, digital waxing, and wall for mock-up and 3D printed models. The treatment options were shown and explained to the patient. We opted for gingivoplasty and osteotomy surgery, aiming at a better gingival contour.

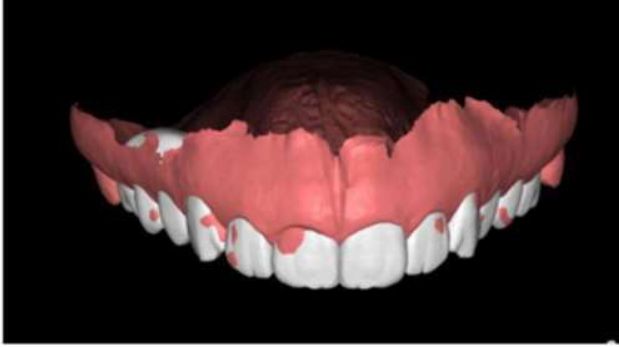


Source: Own authorship.

**Figure 5. Initial clinical appearance**

Initially, a protocol of tomographic measurements to be performed to evaluate and determine the amount of bone and gingival tissue to be removed was established. In this protocol, the distances from the cemento-enamel junction (CEJ) to the bone crest were measured, which will determine the need for bone recontouring, distance from the gingival margin to the bone crest, distance from the CEJ to the gingival margin. With the measures taken, the virtual planning of the case began. The patient's DSD (2D planning) was first performed through the photographic protocol carried out [14], inserting the dental proportion obtained in the tomographic measurements in the smile design. Through tomography, a dental proportion of 75% was

obtained, determined by measuring the anatomical crown of the patient. With the 2D planning ready,



Source: Own authorship.

**Figure 6. Initial 3D model**



Source: Own authorship.

**Figure 8. Final 3D Model**



Source: Own authorship

**Figure 9. 3D printing prototyping**

With all the planning approved and the models printed, the surgical guide for periodontal recontouring was made. Through a 3D printer, the digital model took shape. The margin and upper contour of the guide were determined by measuring 3.0 mm above the cervical margin of the teeth. In the cervical contour of the teeth, a cut was made delimiting the lower edge of the future gingival margin. The purpose of this clipping is to establish the exact limit for the incision of the gingival tissue, thus avoiding excessive tissue removal and establishing the ideal contour determined by planning [3].

A diagnosis of mixed gummy smile type (excessive gingival display in the anterior and posterior regions). Being established as etiological factors: short clinical crowns (altered passive eruption). Thus, she was given an option to correct the SG by surgically lengthening the crowns

bone tissue (osteotomy) to lengthen the apparent crown and reestablish the gingival zenith. Then, the digital planning was presented to the patient with the initial 3D models, without removing the areas to be reduced, and the ideal post-treatment model with removal of the areas to be reduced with the simulation of gingivoplasty.



Source: Own authorship.

**Figure 10. 3D models installed for patient approval**

In addition, the patient was well informed about all instructions and complications and obtained written informed consent. After approval of the treatment plan and informed consent, the adaptation of the oral environment was carried out through basic periodontal therapy and hygiene guidelines and the patient's needs were established, gingivoplasty surgery with osteoplasty for the anterior-superior region with the aid of a surgical periodontal guide to remove gingival tissue and bone tissue. The surgery was scheduled for the following week with the purpose of promoting correction of the gingival tissue with minimal tissue loss and bone removal in the region of elements 15 to 25. The surgical steps consisted of, after the procedure, an adequate dose of local anesthesia (lidocaine 2% with 1: 200,000 epinephrine) administered to the buccal mucosa from element 15 to element 25. Then, the same elements were probed, the surgical guide was installed and bevel and intra-sulcular incisions were made along the entire length of the gingival margin guided by the model using 15c surgical blades (Figures 11 and 12). The bevel incisions (internal external) and intra sulcular were made bypassing the internal margin of the guide in position, then a collar of gingival tissue was released and with the aid of curettes the excised gingival tissue was removed. Subsequently, the gingiva was contoured and scraped to remove residual tissue marks.



Source: Own authorship.

Next, the guide was removed so that a full-thickness flap could be made with the aid of a Molt-type elevator, thus exposing the bone tissue. The guide was replaced and with the aid of spherical carbide drills and Ochsenbein chisels, the osteotomy and osteoplasty were performed according to the external margin of the guide. Paying attention to the positioning and particularity of the zeniths of each dental element involved in the surgery at the time of the osteotomy. The flap was repositioned, since the biological distances were preserved. Next, vertical mattress-type sutures were performed in the papilla line of each element involved (Figure 13).



Source: Own authorship.

**Figure 12: Incisions**



Source: Own authorship.

**Figure 13. Vertical mattress type sutures**



Source: Own authorship.

**Figure 14. Final aspect after 10 days**

The patient was examined approximately 10 days after the procedure, where the suture was removed. The patient did not complain of pain or any post-surgical discomfort. From the clinical aspect, the patient showed signs of good healing, with no bleeding or edema (Figure 14).

## DISCUSSION

Several factors directly interfere with smile aesthetics, which may be of muscular, skeletal, dental or mucogingival origin [6]. Planning for the treatment of gummy smile is essential for the success and prognosis of the surgical procedure performed. He must contemplate the patient's complaint, obeying a correct diagnosis and choosing the best surgical technique according to the etiology of the problem. This set should act jointly, benefiting both the patient and the professional [9]. Currently, periodontics is experiencing a new era along with the new technologies offered in the dental field, where through resources such as Computed Tomography (CT), digital intraoral scans, facial analysis programs, making 3D models and the use of guides, the professionals can provide less invasive diagnostic methods with more predictable results for their patients [16]. Planning through digital means allows the professional to outline each surgical act and the amount of gum or bone structure removal. This tool allows for better communication between the professional and the patient about the result of the procedure and its approval [4]. For the correction of the gummy smile, several types of treatments have been suggested, among them the minimally invasive, when there is no use of flaps and bone exposure and those that use the total flap to visualize the bone tissue, facilitating the osteoplasty [1]. Regardless of the technique to be used, it is important to always act according to biological standards, thus determining a correct positioning of the interpapillary tissue and avoiding root exposures or gingival recession. The distance between the bone crest and the JCE ranges from 1.5 to 2mm, in cases where there is no such distance, bone remodeling must be performed through osteotomy, so that in this way the conjunctiva insertion can be accommodated, junctional epithelium and gingival sulcus (biological space) [1]. In patients whose smile is not aesthetically pleasing, either due to excess gingival tissue without the presence of periodontal disease, gingivectomy has been an alternative. Therefore, this technique was used on the patient, altering the gingival contour in order to reduce the gingival margin, creating a cut gingival contour, thinning the inserted gingiva, creating vertical interdental grooves and remodeling the interdental papilla. The present clinical case achieved a very satisfactory clinical result in terms of aesthetic improvements in the dentogingival relationship, since the patient had a tall smile and gingival exposure greater than 3 mm when smiling. The main advantage of second-guided surgery has been based on greater safety provided by the precise intraoperative anatomical location, minimizing the chances of complications arising from the surgical process [13].

## CONCLUSION

The surgical correction of the gummy smile using the gingivectomy technique with osteotomy had a positive impact on the improvement of the patient's quality of life, this surgical technique is minimally invasive, which resulted in a postoperative period without interference, allowing the patient to return to her activities in a short period of time. The use of technologies for digital diagnosis provided greater predictability of results and surgical precision.

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