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Esthetic-functional multidisciplinary rehabilitation – Case report

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***Abstract*—** *The esthetic demands have increased considerably over the years in the routine dental practice. Facial harmony is directly related to the smile, which is formed by the combination of three components: teeth, gingiva and lips. The excess gingival exposure, commonly described as "gingival smile", has received greater emphasis in Dentistry in the last years and has been the complaint of many patients, because this situation can influence the self-esteem and social relationships. It is fundamental to establish the correct diagnosis of gingival smile to allow a specific therapy for the patient. This paper presents, by a case report, the esthetic and functional scope by a multidisciplinary approach with association of correction of gingival smile and placement of esthetic ceramic crowns. The interaction between Periodontology and Prosthodontics proved to be essential to achieve health and harmony between dental and periodontal tissues, allowing to meet the patient's expectations, optimizing the esthetic and functional result, besides providing longevity.*

I. INTRODUCTION

The communication means have increasingly diffused and demonstrated the importance of esthetics and wellbeing on the self-esteem and quality of life of individuals. The current standard of dental beauty, under influence of a consumer culture, establishes that the smile is considered pleasant when there is harmony between teeth and gingival tissue, without discrepancies in the proportion between teeth and correct gingival contour [1,2].

Several parameters interfere and are assessed in the esthetics of smile, such as the extent of gingival exposure, midline, buccal corridor, ratio between width and height of incisors, inclination of incisor crown, gingival contour and the smile arc aspect, among others [3-5].

The excessive gingival exposure during smile, known as a gingival smile, associated with short clinical crown of upper anterior teeth, can result in esthetic problems, and interventions for gingival tissue remodeling are often indicated, reestablishing the anatomical characteristics and

ideal relationships between teeth and protection periodontium [6].

The esthetics of smile only becomes pleasant when there is a harmonious correlation between lips, teeth and gums, when these elements are arranged in adequate proportion, and the exposure of gingival tissue is limited to 3mm [7,8]. In cases where there is gingival exposure greater than 3 mm, the condition is considered unesthetic, called gingival smile [9-13].

Several etiologies are related to excessive gingival exposure, such as altered passive eruption, anterior tooth extrusion, vertical maxillary excess, short and hyperactive upper lip or a combination of these factors [14]. The altered passive eruption occurs when the periodontal complex does not migrate apically towards the cementoenamel junction, covering part of the clinical crown, leading to short teeth [15]. It is fundamentalto know the correct etiology to establish an adequate and structured treatment plan for each individual [16,17]. The correct diagnosis of the cause and adequate selection of the surgical technique to correct the gingival smile are fundamental for the success of treatment that may involve orthodontic, periodontal and surgical therapies [18,19]. Besides the treatments for gingival smile, which are mostly basedon surgical corrections, there are other less methods to correct this smile characteristic, such as the use of botulinum toxin [20-25].

The amount of vertical dental and gingival exposure in smile has called interest in smile esthetics [26], and thus the multidisciplinary approach involving periodontal and restorative treatments has become increasingly common in Dentistry, since the demands have increased by the patients, especially in cases with involvement of the anterior region [2].

The clinical crown augmentation for esthetic purposes is indicated when the anterior teeth are short or have excessive gingival tissue exposure and when the gingival contour is irregular [27,28]. The therapeutic procedure depends on the etiology and severity of the case, which may indicate the excess removal and remodeling of gingival tissues. This surgery is one of the tools of Periodontology in the search for esthetics, and the correct planning and accomplishment provides great esthetic and functional results [29].

Gingivectomy is indicated when there is need to remodel only gingival tissues; if the bone level is adjacent to the cementoenamel junction or even covers it, gingivectomy is performed together with osteotomy. Surgical techniques to augment the clinical crown can effectively solve esthetic problems [30-32].Planning of the surgical technique for apical repositioning of the gingival margin, not exposing the root surface, is based on the amount of keratinized gingiva and relationship of the cementoenamel junction with the gingival margin and alveolar bone crest [20,33-35].

Esthetic resolutions in the smiles of patients may include periodontal procedures, such as periodontal plastic surgeries for clinical crown augmentation and direct or indirect restorative procedures, such as reshaping with resin composite or placement of ceramic veneers/crowns [8]. An accurate treatment plan is necessary based on knowledge of gingival morphology, bone architecture, dental anatomy, indications and limitations of current restorative materials[36].

Considering the need for coronal reconstructions in esthetic areas, such as anterior teeth, dental ceramics have been widely used because of their good optical characteristics, biocompatibility and resistance to corrosion [37,38]. The preference for ceramics in dentistry is related to their excellent esthetic results, improved optical and mechanical properties, besides their known longevity [39,40]. They were developed to replace ceramometal restorations, which present remarkable mechanical durability for more than four decades but have the disadvantage of metal appearance by transparency at the cervical margin, compromising the esthetics. All-ceramic crowns present biocompatibility, resistance to compression, thermal conductivity similar to the tooth, color stability, translucency, opacity, opalescence and fluorescence.

Crowns made with IPS E-max ceramic system (Ivoclar Vivadent), composed of lithium disilicate,are consolidated in the scientific literature [41,42]. The IPS E-max ceramic system presents as a modern and innovative alternative, composed of lithium disilicate crystals embedded and joined to a glass matrix in a proportion ranging from 60 to 70% in volume of crystals. It presents a structure with good translucency, which reflects light very well, due to the low refraction index of lithium disilicate crystals and high flexural strength [43,44]. Correct diagnosis, adequate planning, knowledge on materials and techniques are essential for the treatment success [45].

Considering the importance to achieve harmony for the reestablishment of smile esthetics, this paper study reports a case of an interdisciplinary therapeutic approach, using protocols of restorative dentistry and periodontal plastic surgery.

II. CASE REPORT

A 35-year-old female patient attended the dental clinic searching for esthetic rehabilitation of smile, complaining

about short teeth with altered colorand excessive gingival appearance. Clinical examination revealed that the patient had a wide gingival smile and ceramometal prosthetic crowns on teeth 11, 21 and 22, with unsatisfactory characteristics (Fig. 1 A-C).

For better oral health adequacy, sessions of root scaling and oral hygiene were performed. Radiographic examination revealed that these teeth (11, 21 and 22) presented endodontic treatment and cast metallic posts with satisfactory conditions (Fig. 1 D).

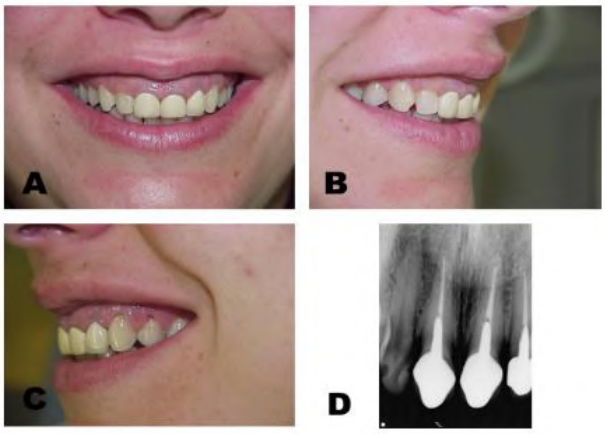

Fig.1 –(A) Initialclinical situation, evidencing altered smile esthetics, wide gingival smile and ceramometal prosthetic crowns on teeth 11, 21 and 22; (B-C) Viewof the patientsmile in profile, showing great gingival exposure and short clinical crowns; (D) Periapical radiograph of the anterior region.

Dental casts were obtained, and after planning a multidisciplinary treatment was proposed to the patient comprising gingival plastic surgery with esthetic purpose for clinical crown augmentation, and fabrication of new ceramic crowns on the upper incisors for a better esthetic harmony of smile. Gingival resection surgery (gingivectomy) is an effective adjutant procedure for gingival adequacy, aiming not only at satisfactory esthetic results, but also at maintenance of periodontal health.

The ceramometal crowns on the upper incisors were removed for placement of properly adapted provisional crowns, which were maintained during the planned treatment stages.

In a subsequent clinical session, an adequate protocol for gingival plastic surgery (gingivectomy) was carefully followed. First, local anesthesia was performed from upper canine to upper canine. Then, the bleeding points were marked with a millimeter probe and joined with a *Kirkland*knife to prepare an excision line. Following, external gingivectomy incisions were made using only a surgical blade n. 15c (*Hu-Friedy*) positioned at 45°with the tooth long axis, apically to the bleeding points.

Then, the excised gingival tissue was removed using pliers and an *Orban* knife. Subsequently, the gingiva was contoured and scraped to remove residual tissue marks. For complementation of the technique, bone exposure was necessary to promote a better architecture, performing escape grooves with round diamond burs, vertical wear at proximal regions, maintaining interproximal peaks and depressions in free surface regions, completing the entire process of bone treatment with horizontal wear to reduce the bone thickness and smooth the previously made escape grooves.

After this stage, the gingival tissue was sutured, providing the new gingival contour. The provisional crowns were cemented, and the patient was prescribed analgesic and oral antiseptic (Dipyrone 500 mg / Chlorhexidine 0.12%) postoperatively, as well as local care. The postoperative follow-up was performed for 60 days until complete healing of the area was completed. After this period, the new esthetic ceramic crowns were initiated (Fig. 2 A).

Teeth 11, 21 and 22 were prosthetically re-prepared, respecting the appropriate biomechanical principles, recommended wear thickness, obtaining longer clinical crowns and intrasulcular cervical ends. Tooth 12 was also ground to receive a ceramic veneer, to harmonize with the anterior esthetics (Fig. 2 B).

To obtain the working dental cast for fabrication of ceramic crowns (Fig.2 C), gingival retraction was achieved by the dual cord technique and the impression was obtained with addition silicone in one step, i.e. the putty and light materials were applied simultaneously, to achieve impression of the entire arch using an unperforated rigid metallic tray.

Fig.2 – (A) Clinicalaspect of patient's smile after corrective surgery for clinical crown augmentation. Note the amount of increase by placement of provisional crowns place before the surgical procedure; (B) Prosthetic re-preparation on teeth 11, 21 and 22 and initial prosthetic preparation on tooth 12; (C) E-Max ceramic crowns on the upper incisors.

After laboratory preparation, functional and esthetic adjustments were performed on the ceramic crowns in the

patient's mouth. Subsequently, they were cemented with self-etching resin cement, which has advantages of easy handling, no need of pre-treatment of the tooth, high resistance to compression, good esthetic properties, chemical adhesion to the tooth and high bond strength to all restorative materials. Before cementation, prophylaxis was performed with pumice and water on the preparations, followed by washing and air-drying.

The crowns were etched internally with 10% hydrofluoric acid for 20 seconds, followed by abundant water rinsing and air drying. Soon after, silane was applied for 1 minute, which reacts with the crystalline phase of ceramic and with the organic phase of the resin cement, to act in the connection between structures and adhesive application. After loading with cement, the crowns were placed in the teeth and inserted inthe preparations, and the excess material was removed for later light curing (Fig. 3).

Fig. 3 – (A-B) Ceramic crowns placed on teeth 11, 12, 21 and 22.

The occlusal contacts were evaluated in maximum intercuspation and eccentric movements, making the necessary occlusal adjustments with diamond burs and final finishing and polishing with a ceramic rubber system. The final result demonstrated a natural and functional estheticsby the integration of esthetic techniques for dental rehabilitation combined with gingival plastic surgery (Fig. 4).

Fig. 4 – (A) Final aspect of frontal smile after the multidisciplinary approach, evidencing the harmony between the patient's teeth, lips and gingiva; (B-C)Lateral views of patient's smile.

III. DISCUSSION

Dental treatment in esthetic areas represents a challenge for clinicians, since it can involve complex decision making for the concomitant search for health and harmony between dental and periodontal tissues. For these cases, the balance between white and red esthetics depends on the professional's skill, scientific knowledge in anatomy and morphology of involved tissues and needs and preferences of patients seeking for treatment [46]. Currently, many surgical procedures are available for proper management of periodontal tissue, aiming at establishing gingival-dental esthetic standards, combined with restorative procedures. The most employed periodontal procedures are clinical crown augmentation of upper anterior teeth, performed only on the gingival tissue, associated or not with bone tissue. The esthetic appearance changes and patients are usually surprised by the new size of teeth [47,48].

A beautiful smile provides a correlation of harmony between proportions, positioning, shape and colors of teeth, as well as appropriate interrelation between teeth, gingiva and lips [49]. The literature shows that the increased gingival exposure in smiling has worse esthetic perception by dentists and laypeople [50,51]. Concerning the patient's smile, the line formed by the lips when a person smiles can be classified as low, which refers to exposure of about 75% or less of the height of clinical crown of upper anterior teeth; average, in which the entire teeth can be seen or at least 75% of their clinical crown, besides the interdental papillae; and high, when the cervical-incisal height of teeth is completely seen and the amount of visible gingival tissue is greater than 3 millimeters, being then classified as gingival smile [52].

The attractiveness of smile is influenced by the extent of gingival exposure, in the opinion of both dentists and laypeople [16]. Therefore, it is essential to perform a dental planning integrating different areas, to accurately diagnose, prognose, plan and perform the oral rehabilitation procedures [8,53,54].

In the functional and esthetic reconstruction of teeth, lithium disilicate ceramics (IPS E-max) have presented as one of the main materials, with important characteristics as high resistance to compression and abrasion, color stability, biocompatibility, radiopacity, coefficient of thermal expansion similar to the dental structure and great ability to simulate the natural appearance of teeth [2,55,56]. In this case, we selected the esthetic rehabilitation of anterior teeth with ceramic crowns due to the esthetic excellence, mainly due to absence of metallic margin [57].

The acceptance of this procedure is so significant thata study conducted among American dental professionals revealed that 91% considered ceramic restorations as the best choice for esthetic restorations [58]. Dental ceramics have very satisfactory characteristics for an indirect restorative material: optical properties similar to the dental

structure, favoring the esthetics, smooth surface contributing for periodontal health; low thermal and electrical conductivity and biocompatibility [59-61].

The key to the success in achieving results with excellence in rehabilitative treatments is closely related to the balance between white dental esthetics and pink gingival esthetics [54,62].

IV. CONCLUSION

Considering the constant search for improved procedures that simultaneously allow the rehabilitation of smile harmony, biological complex and recovery of patients' self-esteem, interdisciplinarity plays a fundamental role in treatment planning and accomplishment, for which periodontal and restorative esthetic approaches must be within the clinical team's skills. Knowledge on esthetics for a good planning, followed by treatment with combination of multidisciplinary techniques, allows more predictable and satisfactory results. As shown in this case, the clinical results achieved by the interdisciplinary approach provided optimization of pink and white esthetics in a patient with gingival smile and unsatisfactory dental morphology.

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