

## Multidisciplinary Treatment after Orthodontics: Crown Lengthening and Dental Whitening in the Final Aesthetic Resolution of Smile

### Tratamento Multidisciplinar Após Ortodontia: Aumento de Coroa Clínica e Clareamento Dental na Resolução Estética Final do Sorriso

Thais Akemi Sako<sup>\*a</sup>; Geórgia Rondó Peres<sup>b</sup>; Diego Oliveira Bavaresco<sup>b</sup>; Danielle Gregorio<sup>c</sup>; Larissa Sgarbosa de Araujo Matuda<sup>b</sup>; Luciana Prado Maia<sup>c</sup>

<sup>a</sup>Maringá State University. PR, Brazil.

<sup>b</sup>University of Western Sao Paulo. SP, Brazil.

<sup>c</sup>Unopar, Stricto Sensu Graduate Program in Orthodontics. PR, Brazil.

\*E-mail: [thaisakemiunoeeste@gmail.com](mailto:thaisakemiunoeeste@gmail.com)

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#### Resumo

Após a conclusão do tratamento ortodôntico, os pacientes começam a se preocupar com outros fatores estéticos para garantir um sorriso harmonioso, sendo mais exigentes com a aparência. Além de dentes alinhados e harmoniosos, os pacientes estão em busca de um sorriso mais branco, se tornando cada vez mais exigentes com a aparência, cabendo ao dentista atender a essas necessidades. Um outro fator que pode tornar o sorriso antiestético é a presença de dentes curtos, que resulta em exposição excessiva da gengiva e um sorriso com aspecto mais infantil, e que muitas vezes é percebido apenas a finalização do tratamento ortodôntico. O objetivo do presente estudo foi revisar o tratamento estético do sorriso após ortodontia, associando cirurgia periodontal para aumento de coroa clínica e clareamento dental. O sorriso gengival pode ser corrigido integrando várias especialidades odontológicas devido às suas inúmeras causas, podendo ser indicada a realização de procedimentos cirúrgicos, ortodônticos ou restauradores. Quanto ao amarelamento dos dentes, uma das técnicas utilizadas é o clareamento dental, que consiste num procedimento pouco invasivo, indicado na maioria dos casos de manchas extrínsecas. O clareamento pode ser caseiro ou de consultório, mas em ambos os casos, o cirurgião-dentista precisa dominar a técnica. Nesse contexto, cabe ao ortodontista identificar e diagnosticar essas necessidades do paciente e encaminhá-lo para outros especialistas. Em conclusão, para alcançar os resultados esperados pelo paciente são imprescindíveis uma boa anamnese, um correto diagnóstico e o planejamento multidisciplinar do caso. Portanto a inter-relação das especialidades é imprescindível a fim de obter resultados satisfatórios e agradáveis ao paciente.

**Palavras-chave:** Periodontia. Gingivectomia. Estética Dentária. Sorriso. Clareamento Dental.

#### Abstract

*After the end of orthodontic treatment, patients become more rigorous with their appearance and worry about other aesthetic factors to ensure a harmonious smile. In addition to aligned and harmonious teeth, patients are looking for a whiter smile, becoming more and more rigorous with their appearance, leaving the dentist to meet these needs. Another factor that can impair smile aesthetics is the presence of short teeth, which results in an overexposure of the gum and a smile with a more childlike aspect, and that it is often perceived only at the end of orthodontic treatment. The aim of the present study was to review the aesthetic treatment of the smile after orthodontics, associating periodontal surgery to increase the clinical crown and tooth whitening. Aesthetics is the relationship between several factors. The gummy smile can be corrected by integrating several dental specialties, due to its numerous causes, and surgical, orthodontic or restorative procedures may be indicated. For tooth whitening, one of the techniques most indicated is dental bleaching, which consists of a minimally invasive procedure, indicated in most cases of extrinsic stains. The whitening can be made at home or in office, but in both cases, the dentist needs to master the technique. In this context, it is up to the orthodontist to identify and diagnose these needs of the patient and refer him to other specialists. In conclusion, a good anamnesis, a correct diagnosis and multidisciplinary case planning are essential to achieve the results expected by the patient. Therefore, the interrelationship between specialties is important in order to obtain satisfactory and pleasant results for the patient.*

**Keywords:** *Periodontics, Gingivectomy, Esthetics, Smiling, Tooth Bleaching.*

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#### 1 Introduction

The smile is extremely important to manifest facial expressions, such as showing feelings of joy, success, sensuality, affection, and even reveal self-confidence and kindness. It is a way to communicate, to socialize and also to attract other people (SEIXAS *et al.*, 2011, DAYAKAR *et al.*, 2014).

In dentistry, aesthetics is related to the harmony of the smile, which is the result of several factors related to the teeth, such as exposure, appearance, shape, position and colour, and also characteristics of the lips (SURAGIMATH; LOHANA; VARMA, 2016, SANTOS *et al.*, 2017). In addition, aspects of

the gingival tissue are considered, such as colour, symmetry of the gingival contour, papillary triangle and the highest point of the marginal gingiva, called zenith, which must be as harmonious as the dental criteria (SEIXAS *et al.*, 2011, DAYAKAR *et al.*, 2014, SURAGIMATH; LOHANA; VARMA, 2016)

Currently, there is a high demand in search for smile aesthetics in dentistry. Often, after completing orthodontic treatment, with dental alignment, patients begin to worry about other aesthetic factors to ensure a harmonious smile. In addition to aligned and harmonious teeth, with healthy periodontics and gums, patients are looking for a whiter smile,

becoming increasingly rigorous with their appearance, and dentists must meet these needs (PASQUALI; BERTAZZO; ANZILIERO, 2014).

One factor that can impair a smile aesthetic is the presence of short teeth, which results in smile with more childlike aspect. When the short clinical crown is associated with the display of a wide band of gingiva, it is called gummy smile. Gummy smile is a concern that affects a large portion of the population, with estimated prevalence ranging between 10.5 and 29%. This is one of the aspects generally perceived by patients after completion of orthodontic treatment (ARAUJO *et al.*, 2018).

Another very common complaint is the yellowing of teeth after orthodontics, mainly due to the difficulty of cleaning and the accumulation of pigments due to the fact that orthodontic appliances are plaque retention factors. In addition, after restoring aesthetics, harmonizing the smile and returning the function, when removing the brackets some unpleasant aspects may appear, such as some whitish spots that results from incipient carious lesions, or brownish spots, which results from the release of iron ions by metal brackets, bacteria accumulation or cement penetration in enamel. Additionally, the presence of resinous residues from brackets bonding must be carefully removed with the aid of multilaminated drills, without affecting the enamel (OLIVEIRA; VENTURIM, 2012).

One of the techniques designed to promote people's self-esteem is tooth bleaching, which consists of a minimally invasive procedure, indicated in most cases of extrinsic staining (PASQUALI; BERTAZZO; ANZILIERO, 2014, VIEIRA-JUNIOR *et al.*, 2017). The search for perfect smile makes tooth bleaching a highly requested procedure, as it is a conservative, simple and more commonly used treatment to obtain an aesthetically pleasing smile (PASQUALI; BERTAZZO; ANZILIERO, 2014, VIEIRA-JUNIOR *et al.*, 2017).

Considering the importance in dentistry for a multidisciplinary dental care in order to attend patient's expectations, the precise diagnosis and the choice of appropriate techniques for correcting gummy smile and tooth bleaching becomes relevant when the patient reports the need for improvement of smile aesthetics. Therefore, this study aims to discuss the treatment of gummy smile after orthodontics, associating periodontal surgery to increase the clinical crown and tooth bleaching.

## 2 Development

### 2.1 Method

A bibliographic survey was conducted, from August to November of 2019, in the databases Pubmed/Medline, Bireme and SciELO, using the following keywords: "periodontics", "clinical crown increase", "gingival aesthetics", "gingival smile", "microabrasion" and "tooth whitening". Clinical

studies, reviews of the literature, thesis and books were included. Inclusion criteria were: studies that addressed the surgical treatment of gingival smiles and tooth whitening, in Portuguese or English, with no date restriction. Studies that did not include periodontal surgery techniques to treat gingival smile and tooth whitening, and articles in other languages were excluded.

## 2.2 Results

### 2.1 Smile Aesthetics

Aesthetic harmony is the relationship between several factors together, including aspects related to the teeth and gums (BERTOLLO; SILVA; OLIVEIRA, 2008).

An important parameter in determining the smile aesthetic is the tooth cervical line, determined by the contour of the gingival margin and formed by the union of upper anterior teeth's zeniths. The most apical point of the gingival contour is usually located distally along the long dental axis in the upper anterior teeth (CÂMARA, 2010). The spatial relationship of the margins is important for the harmony of the smile, and its position is influenced by the cemento-enamel junction (CEJ) and the alveolar morphology (CAURIO *et al.*, 2013). Regarding this parameter, it is considered aesthetic when the incisors and canines have their gingival margins at the same level or about 1 to 2 mm apically in relation to the lateral incisor (BERTOLINI *et al.*, 2011), determining the existence of two basic standard of gingival contour: sinuous and straight. The sinuous contour is aesthetically pleasing, and when the gingival zeniths are connected, they form an inverted triangle. In the straight contour, the zenith line from the central incisor to the canine is aligned on the same tangent. The absence of these patterns can be considered anti-aesthetic because it conflicts with the horizontal reference lines of the face (GEEVARGHESE *et al.*, 2019).

Another important parameter is the smile line, which is delimited by the lower edge of the upper lip during the smile. The gingival architecture will have an impact on the smile's aesthetics, and when it is displayed in a discreet way, about 2 to 3 mm, it is considered as part of the ideal aesthetic smile (CHETHANA; PRADEEP, 2016). Thus, the smile line determines the classification of the smile according to the degree of exposure of the teeth and gums, in three types: high, medium or low (ALY; HAMMOUDA, 2016). In this context, the smile will be classified as low when it exposes about 75% or less of the height of the clinical crown of anterior superior teeth; medium when it can be observed at least 75% of the clinical crown and up to 3 mm of the gum; and high when the amount of gingival tissue shown reach values greater than 3mm (ALY; HAMMOUDA, 2016, CHETHANA; PRADEEP, 2016).

The papilla is the gingival portion located between two adjacent teeth, able to act as a biological barrier, to protect periodontal structures, and to improve aesthetics. The absence

of the papilla is related to the availability of adjacent bone support, contour of the bone crest, interdental distance and dimension of the inter-proximal space. The interdental distance should be, on average, 3 mm, to give an adequate shape and volume, and the interdental space on natural teeth should be more than 5 mm (GÓMEZ-MEDA *et al.*, 2018). The papillary line is composed of the tips of the gingival papilla. In the upper central incisors, when under normal conditions, the papilla should be half of the height of its crown (CÂMARA, 2010). Papilla loss can be divided into three classes: Class I when the tip of the papilla is located between the contact point and the interproximal cement-enamel junction; Class II when the tip of the papilla is present at the level or apically to the interproximal CEJ, however coronal to the vestibular CEJ; and Class III when the papilla is at or below the level of the vestibular CEJ (GÓMEZ-MEDA *et al.*, 2018).

The gingival ameia corresponds to smile harmony. Their size, shape and position are determined by the points of contact, teeth shapes and topography of the bone tissue. In addition, the tooth morphology and inclination and the position of the contact points can interfere in the conformation of the gingival ameia, being larger in teeth with a triangular shape than in square teeth (GEEVARGHESE *et al.*, 2019).

The contact point of the upper anterior teeth is descending from the canine to the central incisor, in a way that the contact between canine and lateral incisor is positioned higher than between the lateral and central incisor. The contact between the central incisors is even lower; they must be fair, unless there is a discrepancy in the mesiodistal diameter of the crown. Its position is related to the position and morphology of tooth, therefore, the line joining the contact points will be parallel to the incisal line, when there is no discrepancy between size, shape and angulation of the teeth (CÂMARA, 2010).

The incisal line follows the border of anterior superior teeth. In young patients, the incisal border of central incisors will be below the border of lateral incisor and canine. In the elderly people, a straight incisal line is common. Therefore, the configuration is related to age, with attrition of central incisors over time, affecting the design of the incisal and cervical lines (CÂMARA, 2010). 1 to 3 mm of the incisal margin is visible in the resting position of the upper lip, in most cases. The average number of exposed teeth also decreases with age for upper teeth and increases for lower teeth. In young patients the amount of exposed incisal margin of the upper incisors is approximately 2 to 3 mm, while in a more advanced age the incisal is waste and not exposed. The incisal line of the upper lateral incisors is generally shorter in relation to the central incisors (0.5 to 1.5). The height of the canine cusp is usually in the same plane or above the incisal edges of the central incisors (DANTAS; SILVA; SAKO, 2012, GIMENEZ, 2016).

## 2.2 Etiology of Gummy Smile

The gummy smile is the inadequate relationship between the lower border of the upper lip, the positioning of the antero-

upper teeth, the location of the upper jaw and the position of the gingival margin in relation to dental crown. It probably can be caused by a combination of variables, such as vertical excess of maxilla, hyperactivity of the upper lip, short upper lip and short clinical crown, increased interlabial space at rest, increased overbite and overjet, gingival hyperplasia, tooth-alveolar extrusion and altered passive eruption (DUTRA *et al.*, 2011, SEIXAS *et al.*, 2011, DAYAKAR *et al.*, 2014, NART *et al.*, 2014, DALL'MAGRO, 2015, SURAGIMATH; LOHANA; VARMA, 2016, OLIVEIRA; MOLINA; MOLINA, 2011, SRIPHADUNGORN; CHAMNANNIDIADH, 2017). Therefore, an appropriate diagnosis must be made to define the treatment plan (DAYAKAR *et al.*, 2014).

The aetiology of gingival smile is diagnosed by the analyse of the face, where the level of gingival exposure is observed during speech and smile, and the relationship of upper lip to the upper incisors. Cephalometric tracings can also be used, checking the vertical growth pattern and the axial inclination of the incisors to define the type of facial growth pattern, in addition, the presence of inclination of occlusal plane and curve of Spee (MORO; SANTOS, 2017).

The moderate exposure of gingiva associated with a hypermobile and short upper lip, without skeletal origin, can be effectively treated by surgical replacement of the upper lip, limiting the retractor muscles as a minot zygomatic, orbicularis oris, levator anguli oris and levator labii superioris (MOSTAFA, 2018). Additionally, the dental surgeon is able to treat pathologies of the face and oral cavity in a minimally invasive and effective manner, since he has specific knowledge and training. Botulinum toxin is an effective and safe treatment option, useful to improve aesthetics and achieve patient satisfaction, in cases of hypermobile upper lip with moderate exposure of gum or as a complementary treatment to surgery in more advanced cases in which only surgery may be deficient (ALY; HAMMOUDA, 2016). According to studies for correction of excessive gum exposure caused by hyperactivity of the upper lip, the use of botulinum toxin provides progressive and reversible neuromuscular correction during approximately 3 to 6 months (ARAUJO *et al.*, 2018).

In cases of vertical maxillary excess, the standard value of the vertical length in the anterior region of maxilla ranges from 24 to 28 mm. The covering function when the lip is relaxed maintains a lip seal that protects teeth and gums, support chewing and centralizes retention forces to keep anterior teeth well positioned (SEIXAS *et al.*, 2011). The increase in vertical length of maxilla is common in long-faced individuals, and it can increase the interlabial space, that is the linear distance from lower edge of upper lip to upper edge of lower lip, in the state in which there is no muscle contraction. The normal interlabial space ranges from 1 to 5 mm<sup>2</sup>. When it is increased, usually, dentoalveolar disharmony are present, such as vertical maxillary excess and/or protrusion of upper incisors, leading to the absence of lip sealing and excessive exposure of the gums. These cases should be treated with

orthognathic surgery (SEIXAS *et al.*, 2011).

Gingival hyperplasia also influences the aesthetics of smile, and results mainly from chronic inflammation due to accumulation of bacterial biofilm, but it can also be related to systemic diseases and drugs, such as phenytoin, cyclosporine and calcium channel blockers. In the gingival hyperplasia the gingiva presents an intense red colour, it is located between the papillae or on the gingival margin, has slow progression and no pain, unless there is trauma or acute infection. Prophylactic methods are necessary to decrease plaque index and minimize inflammation, and only then, surgical procedures such as gingivoplasty or gingivectomy can be performed, so that no relapses occur (ALMEIDA; DIAS, 2004).

When the gingiva looks healthy and its eruption process is normal, the upper central incisors emerge through the gum and continue to erupt actively until they touch the opposite tooth. The gingival tissue moves along with the dental crown, and this process is called active eruption. Concomitantly, epithelial adhesion migrates apically from the enamel to a stable coronal position at 1 to 2 mm above CEJ, process called passive eruption (MACHADO, 2014, MANTOVANI *et al.*, 2016). The altered passive eruption (APE) is a clinical condition in which the gingival margin in the adult is located incisal to the cervical convexity of the crown and removed from the cemento–enamel junction of the tooth (ALPISTE-ILLUECA, 2011). This condition is due to a failure of the passive eruption phase to conclude, resulting in an appearance of a short clinical crown. APE is a modification in normal development, which prevents adequate retreat of gingival tissue to the level of the CEJ (CHRISTOU *et al.*, 2019). It may be associated with a short upper lip or excessive lip traction. Consequently, there is occurrence of a short clinical crown and excessive gingival exposure in smile (RISSATO; TRENTIN, 2012, FRIZZERA *et al.*, 2017). It is classified as: type 1, which is characterized by short crowns and an excessive amount of inserted gingiva; and type 2, which is associated with a narrow band of gingiva; and subclassified in classes A and B. In subclass A, the alveolar crest is the normal distance (1–2 mm apical) from the CEJ, thus allowing the gingival fiber apparatus to be inserted as normal onto cementum. In subclass B the alveolar crest is at the level of or coronal to the CEJ, thereby impinging on the space for connective tissue fiber attachment (MACHADO, 2014). The aetiology of APE is the result of occlusal interference during the eruption phase, thick and fibrotic gingival phenotype that migrates slowly during passive phase, the presence of supernumerary teeth and ankylosed roots (MANTOVANI *et al.*, 2016). APE cases can be corrected through periodontal flap surgery.

The coverage of the upper lip tends to increase with age due to sagging of the lips, with a higher prevalence of gummy smiles in young people. For a correct diagnosis, it is necessary to correctly classify the gingival level, respecting patient's details such as age, gender and periodontal health, to then determine abnormality of the smile and its aetiology

(BARBOSA *et al.*, 2015, GONÇALVES *et al.*, 2017).

The gummy smile can be corrected by integrating various dental specialties precisely because of its innumerable causes, and surgical, orthodontic or restorative procedures may be indicated (BARBOSA *et al.*, 2015, GONÇALVES *et al.*, 2017). Thus, the aetiology, associated with the classification, will define a correct treatment plan (BARBOSA *et al.*, 2015). Multidisciplinary integration is essential to achieve satisfactory aesthetic and functional results in cases of dental rehabilitation, increasing the chances of a good prognosis and creating a harmonious smile (LANG; LÖE, 1972).

### 2.3 Periodontal Surgery for Gingival Smile Treatment

Surgical techniques for clinical crown augmentation should be established according to the amount of inserted gingiva and the relationship between the bone crest and the CEJ. Ideally, a band of at least 2 mm of keratinized mucosa should be preserved to maintain periodontal health (FARIA *et al.*, 2015). In addition, if there is an invasion of biological space and the distance from bone crest to the CEJ is less than 2 mm (MOSTAFA, 2018), osteotomy is indicated, which is a bone cut and reshape, done with drills or chisels and abundant irrigation with saline solution, that aims to restore a physiological contour and normal biological distances to preserve the support tissues (OLIVEIRA; VENTURIM, 2012).

Therefore, if there is an excess of inserted gingiva and the distance between the CEJ and the bone crest is greater than 2 mm, there is no invasion of the biological space, and gingivectomy is indicated as treatment. When there is a narrow band of inserted gingiva and/or space between bone crest and CEJ is less than 3 mm, flap surgery is indicated (SANTOS *et al.*, 2017).

#### 2.3.1 Gingivectomy and Gingivoplasty

In cases of short clinical crown with probing pocket deep higher than or equal to 3 mm, without bone loss or presence of bone covering the dental crown, and with an extensive band of keratinized gums (LANG; LÖE, 1972), the therapeutic procedure of choice should aim to remove the excesses of gingiva, following the anatomical neck of the teeth and the bone tissue, through resective surgeries, such as gingivoplasty and/or gingivectomy, which is a simple procedure that almost always has positive results.

Gingivectomy decreases the amount of inserted gingiva, removing soft tissue, and is indicated for the removal of supra-bone pockets, gingival hyperplasias resulting from hormonal and inflammatory processes and a clinical crown lengthening. On the other hand, gingivoplasty creates appropriate gingival contour, remodelling this tissue, and is indicated when there is no presence of active periodontal disease, and cases of aesthetic resolution aiming at creating an adequate contour of the gingival margin and remodelling the grooves and interdental papillae.

Usually, the two techniques are associated in the same procedure (SHIVA SHANKAR *et al.*, 2013) and both are indicated for restoration of healthy biological space. Usually, in most cases, surgical removal of 1 to 2 mm of gingival tissue is sufficient, but when the amount of gingiva in height is very significant, it is necessary to perform a more complex surgery (TOMAR *et al.*, 2013, SHIVA SHANKAR *et al.*, 2013).

Some authors claim that gingivectomy should be performed only after completing orthodontic therapy to avoid the need for a touch-up surgery at the end. However, in some cases of gingival hyperplasia it is impossible to fix orthodontic brackets on the patient teeth without compromising the biological space. In these situations, previous periodontal surgical procedures are indicated to improve the clinical crown lengths and allow the placement of orthodontic appliances (PULGAONKAR; CHITRA, 2015).

### 2.3.2 Flap Surgery

In patients with APE, the bone crest usually follows the gingival level, and it is necessary to remove the gingiva and to perform osteotomy and/or osteoplasty, using surgical techniques to obtain an increase in the clinical crown length (OLIVEIRA; VENTURIM, 2012).

Flap techniques can involve flaps of full or partial thickness, which can also be displaced apically. Cases with an extensive band of keratinized mucosa with indication for osteotomy can be treated using the full flap apically positioned technique. In cases that require gingival preservation, the split flap apically positioned is more indicated, as it preserves the gingival margin (FRIZZERA *et al.*, 2017).

## 2.4 Etiology of tooth stains

One of the paradigms most commonly found in the practice of the dental surgeon is to treat the chromatic changes of the teeth, of intrinsic and extrinsic origin (ALBELDA-BERNARDO *et al.*, 2018).

The saliva of patients with extrinsic dental stains has higher concentrations of calcium and greater buffering capacity (CALIXTO *et al.*, 2013). These stains tend to be acquired by the accumulation of biofilm, tobacco or ingestion of food pigment, added to the deficiency of brushing, without the abrasive action of the toothpaste, leading to the darkening of the tooth enamel, which can be removed with simple prophylactic measures or dental polishes (SUNDFELD *et al.*, 2007). The incorporation of chromogenic bacteria, such as *Actinomyces* and *Prevotella melaninogenic* into the enamel or dentin affected, also has extrinsic stains as the etiological factor and has not been associated with the occurrence of caries (CARVALHO *et al.*, 2018). Iron and sulfur are responsible for the dark color of the teeth (COSTA *et al.*, 2012).

Intrinsic changes can be congenital or acquired; teeth with enamel-colored anomalies were treated with wear on their surface, aimed at removing the affected tissue (CALIXTO

*et al.*, 2013). It is now known that it is possible to solve aesthetic problems in a conservative and efficient way. In this context, the use of simple techniques is recommended, such as microabrasive procedures, and if the color change is persistent, one can resort to internal whitening, for devitalized teeth, and external, for vitalized teeth, being less aggressive and with scientific proof of clinical effectiveness (COSTA *et al.*, 2012).

## 2.5 Aesthetic procedures after removal of the orthodontic appliance

After orthodontic treatment is completed, patients have sought to improve the smile aesthetics more and more. In order to correct the bites, brackets are essential during the treatment, however, during the removal, some iatrogenesis or whitish spots may appear due to the demineralization of the dental element, brown spots from the penetrated orthodontic cement, red-brown spots by release of metal ions from brackets, and others. Therefore, the professional dental surgeon evaluates, and indicates the best functional and aesthetic treatment to achieve a good result, after careful removal of the resin residue from the orthodontic appliance with diamond tips, without affecting the enamel (SUNDFELD *et al.*, 2007).

## 2.6 Microabrasion

The use of microabrasion technique is indicated in cases of fluorosis, hypoplasia, imperfect amelogenesis, white mineralized spots, especially those located in aesthetic area, removing superficial stains and texturizing defects, with a minimum loss of enamel. Through the erosive action of acids and abrasive action of some substances, through friction, returning to the enamel a smooth glassy-looking surface (OLIVEIRA; VENTURIM, 2012).

Its mechanism of action consists in combination in paste consistency of an acidic substance (phosphoric acid or hydrochloric acid) with an abrasive substance (pumice stone or silicon carbide) which, when rubbed on the enamel surface, generates minimal wear, eliminating stains and irregularities. Its effectiveness depends on the depth and type of staining (CALIXTO *et al.*, 2013). It is a simple technique, without recurrences, with a negligible loss of tooth structure, returning a healthy clinical aspect (CALIXTO *et al.*, 2013). Microabrasion has been associated with vital whitening technique, which has generated good aesthetic results (QUEIROZ *et al.*, 2016).

## 2.7 Dental Bleaching

### 2.7.1 In Office Dental Bleaching

The main techniques for whitening vital teeth are: home whitening supervised by the dentist and office whitening. However, to reach the maximum potential of whitening practice, to obtain a favourable prognosis and reduce adverse effects, the dental surgeon must master the technique, and

have knowledge about the available products and their reactions when in contact with the dental structure and soft tissues (OLIVEIRA; MOLINA; MOLINA, 2011).

Oxygen from hydrogen peroxide acts as the active ingredient for tooth whitening and has the power to penetrate enamel and dentin, due to its low molecular weight, denaturing the pigments located on the surface and in the deepest part of the tooth. The product is caustic and can cause burns, so soft tissues should be isolated (CALIXTO *et al.*, 2013).

During bleaching, there is a small reduction in enamel microhardness, which may be related to a mineral loss possibly resulting from the composition of the bleaching agent and its by-products, and that was verified in scanning electron microscopy. Additionally, the acids in the gels come into contact with the dental nerve endings, triggering a temporary thermal sensitivity that ceases on its own after treatment or through the use of desensitizing agents, without causing damage to the pulp tissue (OLIVEIRA; VENTURIM, 2012).

The bleaching agents used for office bleaching are 35% carbamide peroxide or hydrogen peroxide ranging from 25% to 50% (most used) and should be handled according to the manufacturer, being applied twice for 15 minutes on the tooth (KINA *et al.*, 2015).

### 2.7.2 At home dental bleaching

The at home system of tooth whitening supervised by the dentist is a technique considered simple, effective, reliable, minimally invasive, with short appointments and low operational cost for the professional, but the patient must be a collaborator (CRESCENTE; PINTO, 2016).

At home bleaching can be done with carbamide peroxide in concentrations of 10 to 22% (BARBOSA *et al.*, 2015), and it can be applied every night for 6 to 8 hours, or during the day for 1 to 2 hours each. Some authors do not indicate the use of the gel during the day more than once, in order to avoid dental sensitivity. In addition to this, it can be made with hydrogen peroxide ranging from 4 to 8%, and this should be used twice a day for 30 minutes to 1 hour (CALIXTO *et al.*, 2013).

Studies reveal that the percentage of reduction in the enamel microhardness against the action of 10% carbamide peroxide for 21 days is very low, however it can be considered that human saliva has the remineralization power acting on the adverse effects created by the action of the acid on enamel, dentin and cement (CALIXTO *et al.*, 2013).

For the at home dental bleaching, patient must use a tray, made from a resilient plasticized siliconized plastic sheet over a plaster model, limited by the dentogingival line or up to 1 mm above this line, towards the gum, promoting a better adaptation, avoiding displacement and reducing the saliva infiltration and the extravasation of the gel into the oral environment (CALIXTO *et al.*, 2013).

## 2.8 Importance of the interdisciplinary treatment

For a satisfactory aesthetic result in gummy smile after orthodontic treatment the patient must be preserved. It is up to the orthodontist to perceive and diagnose these patients' needs and refer them to other specialists. The interrelationship between restorative dentistry and periodontics is undoubtedly the most frequent practice in day-to-day dental offices, both in health-related and aesthetic cases.

Most of periodontal procedures aim at reducing the accumulation of plaque and the ease of cleaning by the patient. The correct adaptation of the restorations is an indispensable condition for the preservation of periodontal homeostasis and the maintenance of gingival health. In aesthetic cases, on the other hand, dental harmony is compromised when pink (periodontium) and white (teeth) aesthetic characteristics are not reached (DAYAKAR *et al.*, 2014).

Excessive exposure of gingival tissue is one of conditions developed or acquired that can manifest in periodontium, with a prevalence between 10.5 and 29% of the population (DAYAKAR *et al.*, 2014), and which affects the harmony of patient's smile (ALY; HAMMOUDA, 2016, CHETHANA; PRADEEP, 2016, SRIPHADUNGORN; CHAMNANNIDIADH, 2017). In addition to being an aesthetic concern, it can also injure lip sealing, being considered an instigating factor for gingivitis (PEDRON *et al.*, 2010). It is a clinical condition with many aetiologies, and may include extra or intraoral components. Therefore, it is necessary to identify the type of gingival smile to establish the correct treatment, for a good prognosis (MANTOVANI *et al.*, 2016). For diagnosis, factors such as lip positioning, gingival architecture, amount of keratinized mucosa and gingival zenith should be considered (BINIRAJ *et al.*, 2015).

Due to the requirements of modern dentistry, patients are given priority to aesthetics in the treatment, with tooth whitening being one of the most sought-after procedures, enabling a satisfactory result and preserving dental structures, when compared to restorative techniques (SILVEIRA *et al.*, 2017).

Considering this aesthetic necessity, it is essential that professionals of different areas work together in order to achieve better results.

## 3 Conclusion

The literature shows that, in order to achieve the expected results in smile aesthetics after orthodontic treatment, a good anamnesis, a correct diagnosis and multidisciplinary case planning are essential in order to obtain more satisfactory results in terms of smile aesthetics after orthodontic treatment.

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