

# Therapeutic approach for gingival smile treatment

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## Abstract

Nowadays patients often look for dental services because of aesthetic reasons. One of the aesthetic problems is the gingival smile - i.e. the excessive exposure of the gingiva while smiling. The major etiological factors associated with gingival smile include: passive exposure, vertical maxillary surge, hyper function of the upper lip muscles and / or a combination of them. This condition has a psychological impact on some patients, resulting in inconvenience, a feeling of unattractiveness and dissatisfaction. The methods for treating gingival smiles are invasive varieties of surgical approaches and non-invasive by botox therapy.

**Purpose:** The purpose of this article is to carry out a unified review of scientific evidences, literature related to the methods used in the treatment of gingival smile, as well as identifying the best correction technique with a long-term predictability of the procedure.

**Materials and Methods:** After analyzing the scientific literature from the databases Web of Science PubMed, Scopus and others, it was found that in most of the cases were examined women whose mean age is under 30 years. In most of the articles predominate reports involving invasive methods, but insufficient datas for a long-term predictability and post-treatment follow-up.

**Conclusion:** This article found a serious lack of controlled and randomized clinical trials in the use of periodontal surgical methods of treatment of gingival smile and stresses the need for clinical follow-up studies with more evidences in order to establish the best type of periodontal surgery for this purpose.

**Keywords:** Botox, Gummy smile, excessive gingival display on smiling, treatment gummy smile

## Introduction

Nowadays patients often look for dental services not only for health reasons, but also for aesthetic reasons in order to achieve more harmonious and symmetrical smiles. The smile of the patient is a kind of emotional tool, a form of communication; attraction and type of socialization. (1) The main task of dental doctors is not only to restore the function, but also to provide satisfaction for the patients after the dental rehabilitation. (2) The harmonization of the aesthetic smile requires precise integration of the teeth and the teeth rows in a moment of rest and in the dynamic of the mimic muscles, tailored to the face shape and the preference of the patient. However, on one hand, still part of the dentists neglect the key moments in their planning of the smile patterns. On the other hand, the harmony of the smile is determined not only by its shape, its position and the color of the teeth, the shape of the frame, but also by the exposure, the morphology and the contour of the gingiva. The presence of excessive visualization of gingivitis in a smile is accepted as a compromise and an unsatisfactory aesthetic result. Today browsing the essence of the smile, we necessarily include an analysis of three main components: teeth, the frame outlined by the lips at a smile and the gingival exposure. (1,2,3,4,5,6,7)

The violations that compromise the aesthetic of the smile, associated with the greater visualization of the gingiva, are a medical condition known as "gummy smile." (6,7). The perception of gingival exposure values is a question of cultural, ethnic, age and gender characteristics, as well as personal preferences. According to Allen (USA), the exposure of the gingiva (below 2-3 mm) could be counted for acceptable and relatively aesthetic state, while overexposure (over 3 mm) is considered unattractive and an aesthetic problem. (6,8,9,10,11) Unlike from the United States in some parts of Europe, the allowed norms may exceed those values and reach acceptable 4mm range. (10) While these values of 3 or 4 mm are accepted for women, only men are expected to have exposure of the frontal teeth. The effects of age lead to the loss of muscle tone, which results in a lower visibility of the upper teeth, respectively of the gingiva and the tendency to increased exposure to lower teeth. (3,4) The gingival smile is recognized by the American Academy of Parodontology (AAP), such as deformation and mucosalgic condition affecting the around teeth area. (10) The sexual dimorphism indicates that a gingival smile is more common in women - 10% of them being registered among the population between age of 20 and 30. (12)

In order to establish a correct diagnosis, the exact classification of the gingival level is needed, taking into account the factors - sex, age and periodontal health. After finding an anomaly in the level of the gingiva in a smile is essentially significant to define her etiology. Typically, this condition is multifactorial, associated with excessive vertical growth of the maxilla, reduced length of the top lips, excessive contraction of the mimic muscles of the upper lip, a disproportionate length and width of the frontal teeth or extrusion of the teeth associated with a deep bite. (12,13,14,15,16,17) Taking into account the etiology of the gingival smile, the correct diagnosis on which they are based, will be established therapeutic approaches for treatment and correction of the gingival smile.

In clinical / photographic review, images need to be included in spontaneous and exaggerated smile, video documentation and long - term surveillance expression of the patient, subject to the conditions of isometricity. Some authors recommend radiographic analysis, Ricketts cephalometric analysis, the use of computed tomography. The therapeutic treatment procedure will depend on the etiology, the severity of the case, the age of the patient. (18, 19, 20, 21, 25, 26, 27)

**Therapeutic approaches:** The main therapeutic approaches, according to the etiology, can conditionally be divided into dental, gingival, bone and muscle approaches etiology. (22,23)

In dental etiology there is an excessive extrusion of the upper incisors, which can be treated by intrusive mechanical methods. In this case the problem is limited to the frontal area. In patients with gingival etiology gingivectomy operative interventions are applied. In bone etiology, characterized by a vertical maximal surplus occurring predominantly in patients with predominantly vertical growth should be applied surgical oprogenic interventions.

Muscle relaxation and frenectomy are most often indicated for short upper lip, determined by the Ricketts cephalometric analysis. The use of botulinum toxin (Botox) is indicated in cases of hypercontraction of levator labii superioris, determined by eliminating other etiologies. (1,6,9,14 and others), treatment by infiltration into the paranasal region with a hyaluronic technology filler. (24) The objective of this article is to carry out a unified review of scientific evidence, literature related to the methods used in the treatment of gingival smile, identifying the most appropriate correction and long-term techniques predictability of the results of the procedures, used by conservative and invasive therapeutic approaches for the treatment of the GS.

## Aim

The purpose of this article is to carry out a unified review of scientific evidences, literature related to the methods used in the treatment of gingival smile, as well as identifying the best correction technique with a long-term predictability of the procedure.

## Material and methods

The literary survey was conducted in the first quarter of 2019. The information was gathered manually and electronically as they were used the scientific databases of PubMed, ResearchGate and others. The search included the key words: gummy smile treatment; Excessive gingival display on smiling; botox gummy smile, crown lengthening, gingivectomy, surgery, plastic etc. After selecting the titles, the abstracts and the conclusions, were selected texts containing information about diagnostics, treatment methods, follow-up results and conclusions.

## Results

The tabular figure lists the data that includes methods of etiological treatment, the variability of the techniques used, the results achieved, the long-term stability of the achieved results. Among the patients seeking GS treatment, after the trials screening studies, the authors found that the hypercontraction of levator labii superioris is the most prevalent etiology of 45.3%, but is also common in combination with altered passive eruption APE 34%. (25) Based on this study, those searched results were divided into three groups of etiological treatment methods.(Table 1) A total of 74 publications were reviewed, of which 65 were selected.

Tabl.1 Results divided in three groups of etiological treatment methods

Methods for etiological treatment	Variability of the used techniques	Achieved results	Long-term stability of the achieved results
<b>1. Dental, gingival, bone</b>	+	+	+
<b>2. Muscular etiology</b>	+++	+	++
<b>3. Combined</b>	+	+	-

The articles were dominated by clinical reports, two reports and were found two randomized controlled trials of surgical periodontal methods for treatment. The longest period of follow-up is the treatment of the GS of orthodontic etiological indicator is 21 months and oprogenic and periodontal surgery methods of maximum 6 to 12 months. (32,33,47,48, etc.) Only in one report has been reported about lips repositioning as an alternative to the invasive surgery with satisfactory results that are stable for 4 years. (37)

All reports show patient satisfaction after treatment and positive aesthetic result. In the examined literature is identified the genetic predisposition and dysplasia of the nasal septum as an etiological factor. The predominant papers that comment on the surgical methods are mainly with myotomy, upper lip reposition, gingivectomy with osteotomy. The current trend discussed in most of the articles regards less invasive botulinum toxin techniques. All related articles with relaxation of the muscles by botox are a clinical case and all of them indicate satisfaction, lack of post-operative complications but short-term effect.

## Discussion

Ishida Y and Ono T., describe GS effective alternative treatment for improving a gummy smile in a patient with a severe Class II molar relationship, severe crowding, and lip protrusion using zygomatic anchorage devices and improved superelastic nickel-titanium wires; alternative treatment option to orthognathic surgery for adults with high-angle skeletal Class II malocclusion and a gummy smile. (28)

In cases of GS from dental, gingival, bone etiological treatment, the periodontal doctor is a leading specialist. Clinical examination and radiographic evaluation will allow clinicians to determine the position of the gingival margin, bone crest and cemento-enamel junction and thus cause a correct diagnosis of the subtype of altered eruption. The periodontist will need to consider these factors in order to obtain a satisfactory result, especially in multidisciplinary cases. (29). When treating a gingival smile with muscular etiology, mood and treatment with oral or reconstructive surgery, repositioning lips as an alternative to invasive surgery with satisfactory results that are stable for 4 years. (37) Alammam AM, Heshmeh OA. Repositioning of lips is an effective method of treating EGD, however, the detachment of the muscle provides a more stable result for 12 months than the classic technique. According to them, more studies are needed to fully evaluate this procedure. (35, 40) Classical predictive techniques for lip and laser extension of the crown in vertical

maxillary cases, describes Ramesh AI, in a series of cases they point to the predictability of the technique of repositioning of the lips with 2 years CR follow-up. (57)

The botox approach requires quality assessment to determine the level of the evidence and the deviations, and to perform a meta-analysis. There are really weak evidences to be determined the duration of effectiveness of toxin of type A on GS. The effect is stable to at least 8 weeks of follow-up and the gingival exposure may not return to the baseline within 12 weeks of the tracking. For strengthening the evidences are required well-developed randomized clinical trials tests with a minimum of 6 months of follow-up. (45) The combined gingivectomy and the botox injection technique in heavy-duty management of the GS could be appropriate (59)

The micro-autologous fat transplantation (MAFT) is a potential alternative approach. Huang Sheet al. examined seven patients with GS treated with MAFT between October 2015 and April 2017. In their study they seek to determine long-term results of the MAFT. The centrifuged purified fat microtransplants in the nasolabial groove, the upper lip areas using MAFT-GUN while patients were under general intravenous anesthesia. The average age of the 7 patients is 31 years (range 23-40 years). The average MAFT's operating time is 52 minutes (range: 40-72 minutes), and the average volume of the fat delivered in the nasolabial groove, the upper lip is 16.1 ml. (46) The smiles of the 7 patients showed significant improvement at mean time follow-up of 12.9 months. Outputs: According to Huang Sheet al. treatment of GS, using MAFT is an efficient, reliable and relatively simple method, high patient satisfaction and minimal risk of complications. Except the main approaches focused on the individual etiology from bone, dental, muscle, soft tissue and their combination, Wei J et al. also indicate the identification of nasal dysplasia as etiologic GS factor. (63,64) In a controlled study of 46 patients with significantly increased columella upward maximum movability, underwent surgical treatment for excessive gingival exposure by septum cartilage reinforcement and, where required, additional extension using an autologous graft or an expanded cartilage polytetrafluoroethylene implant. In the 46 patients undergoing surgical GS correction, Wei J et al., established the measured maximum exposure of the gingiva in a maximum complete smile was  $4.52 \pm 1.7$  mm before surgery and significantly reduced to  $1.79 \pm 0.26$  mm at 6 months post-operative state ( $p < 0.05$ ). (63)

There is no standardized minimally invasive approach to GS treatment. The Botulinum toxin injection is a new, safe and cosmetically effective treatment for a sticky smile when done by experienced practitioners. However it is required a further randomized controlled trial. Level of proof 4: Therapeutic. (12)

The use of a digital smile design has emerged as a powerful tool in the cosmetic dentistry to help the practitioner and the patient to visualize the end result. (65)

## Conclusion

The etiology of the gingival smile dictates the most appropriate treatment approach. The need for accurate diagnosis, specialized communication and the complex plan of modern alternative treatment of the therapeutic processes are important factors for achieving a predictable aesthetic result.

There is no standardized minimally invasive approach to treat the GS, but an increasing demand is recognized for less invasive techniques - for example - interventions associated with the injection of

botulinum toxin and the micro-autologous fat transplantation. Although the reported positive results are required additional controlled clinical trials.

After a thorough analysis of the articles, it was found that there was not enough clinical controlled and randomized evidences, and multiple studies for both invasive and non-invasive methods for GS treatment. The main findings relate to patient satisfaction after interventions. The average age of the patients, undergoing periodontal surgery: predominantly young people. This may be related to the aesthetic needs of individuals of that age and to the fact that the condition of a gummy smile gradually decreases with age due to the upper and the lower motility of the oral cavity, which in turn leads to a reduction of the exposure of the upper incisors of the elderly patients. In all studies, women are predominant, because of the greater aesthetic need among women, especially in terms of an attractive smile.

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