

# Dental Morphology as an Aesthetic Reference in Prosthetic Reconstruction of Lateral Maxillary Areas

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**ABSTRACT:** The purpose of this study was to assess the impact of prosthetic reconstruction of the lateral maxillary areas on the dental-facial aesthetics. The so called buccal corridors can have different sizes, influencing the total or partial visualization of the lateral group represented by premolars and molars, with negative consequences upon global aesthetics. The compliance with the dental morphology, but with possibilities of embellishment of prosthetic constructions, influences the smile topography. The assessment of the patients, men and women, started by establishing a research protocol comprising, besides the clinic investigation, a specific sequential approach, which cumulated the additional investigations (x-ray investigation, study of document models, frontal and profile photos). The clinical data were reported and selected depending on the limitative possibilities of the occlusal status, so that a gradual visualization of the dental units at the level of lateral maxillary and/or mandibular areas when smiling, to which the existence or inexistence of the local symmetry is added, associated with the size of the buccal corridor, to allow a relevant planning and assessment of the influential possibilities of the local parameters regarding the smile improvement at this level. The chromatic association of the future prosthetic construction of the current dental constructions as well as the used therapeutic versions, associated with data about age, gender and the training level of the patients, to which we added our experience, have represented references in the final assessment of this study.

**KEYWORDS:** dental aesthetics, smile line, buccal corridor, dental occlusion.

## Introduction:

The reassessment of the "quality" of smile has continuously been a desideratum of the dentist, unfortunately being treated superficially very often. The execution of the prosthetic reconstruction without implementing it in the dental-facial harmony is a frequent mistake. The association of the data gathered by means of clinical investigation with the data representing references of global aesthetics contributes to the achievement and improvement of the dental-facial attraction[1,2,3]. It is known that dental-facial attraction is an integral part of the so called "physical attraction". The impact of the smile is visually absorbed and transposed into the determination of interpersonal relations.

The smile or the "moment of truth" of the communication relations associates various elements starting with dental morphology and its relation with the dental-facial assembly up to the assessment of lips expansion, associated to the psycho-emotional present state. The social integration by smile offers the free consented support of each person of association, assessment and reassessment of interpersonal relations and the dental medicine has the possibility to improve their perception and quality by taking part, willingly or not, to the success or failure regarding the cooperation and

mainly the approaching without imposed or not imposed restrictions of the people[4,5,6].

The purposes of this study have been those of assessing the impact of prosthetic reconstruction of the lateral maxillary areas upon the aesthetics of smile at this level, if the number of visible teeth when smiling influences the aesthetics at this level, as well as the impact of the presence of the buccal corridors upon the smile related to age and gender.

## Material and method:

The study was performed on a number of 30 patients of both genders, aged between 20 and 50 years, selected so as not to suffer from associated disorders of the oral mucous membrane, neuro-motor or neuro-psychic disorders. In order to achieve a comparison of the obtained results and to limit the interpretation errors it was started the individual assessment by gender, age, and in the end the obtained results were summarized. The clinic investigation, of great importance, comprised, besides the usual data, an assessment of the typology of the maxillary-facial territory achieved by highlighting and aiming the local aesthetic aspect, the characteristics and features specific to the various emotional states deliberately induced by the patient, to which there were added or not the cosmetic requests

suggested by us or by patients. The completing of the data thus obtained was superposed to the radiologic study and especially to the document models. The assessment of the initial phase used as starting point in determining the treatment was made so that to follow the requests given by an accurate dental treatment, associated with the assessment and expectations of the patient. The basic idea was a minimally invasive treatment, the possible implanting changes, the position of the dental structures representing the normal status of the patient. A significant role was that related to the occlusal status, the entire prosthetic construction being made so that, with all the interventions used to improve the quality of smile, to allow an occlusal gear in physiological limits. The association of the superior frontal group's morphology to the lateral area(s) constructions allowed an accurate assessment of the obtained aesthetic status. The reference to the visualization level of the buccal corridors, expressed as a ratio between the visible length of the maxillary dentition and the width of the oral cavity opening, allowed the classification of the quality of the physiognomic reconstruction based on the assertions of the patients. The geographical environment of the studied patients was both urban and rural. The studied patients were classified by age in 3 groups, as follows: Group 1 (patients aged between 20 and 30 years), Group 2 (30-40 years), Group 3 (40-50 years).

The first stage of the treatment was the drainage of the oral cavity and the choice as a therapeutic option of reconstruction of the dental arches integrity of using the conjunct gnatoprosthetic metallic-ceramic devices entirely physiognomic. The reference to the idea of the study was achieved by testing the

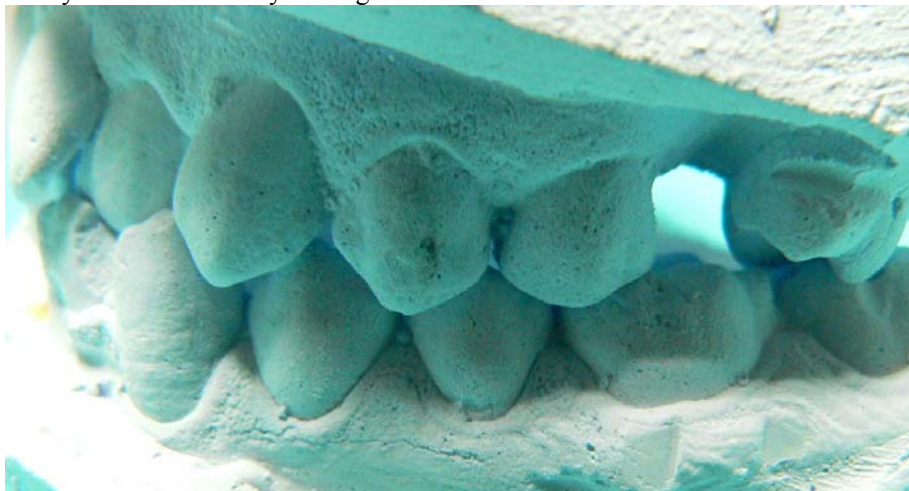
provisional prosthetic constructions in versions that would highlight a change of teeth visualization from the lateral maxillary areas and implicitly a change of the buccal corridors. An "increase or decrease" of the canines was performed, of the first premolars, second premolars and partially of the first and second molars, depending on the clinical situation.

The obtained clinical situations, reported to patients, as well as the preset groups, were quantified to establish the evolution of the aesthetic of smile and finally to agree with the patient the accepted therapeutic solution.

## **Results**

The study conducted on a number of 30 patients divided into three groups aimed the perception of the quality of smile from the point of view of the specialist, dental technician but also of the patient. The division by gender revealed a relative high interest of women for the aesthetic aspect, for the age group between 30 and 40 years, while the ratio is slightly reversed in favor of men for the age group between 40 and 50 years. For the age group between 20 and 30 years, both genders show high interest regarding the aesthetic function.

The selection of the participants to this study also involved additional investigations represented by the radiologic investigation which allowed a highlight of the current status of dentition, the dentition topography requiring prosthetic treatment as well as the reference to the study models investigation, which allowed the assessment from the orthodontic point of view and the approach in certain situations before the prosthetic solution of orthodontic recovery.(fig.1-2)



**Fig.1.Model document**



**Fig.2. Radiologic investigation**



**Fig.3: 3.1 - symmetrical smile, PM1-PM1, Fig. 3.2 - unsymmetrical smile PM1-PM2, Fig. 3.3 - unsymmetrical smile PM1-PM2, Fig. 3.4 - symmetrical smile M1-M1, Fig. 3.5 - unsymmetrical smile PM2-M2, Fig. 3.6 - symmetrical smile PM2-PM2.**

The assessment of the quality of smile was firstly quantified by the visualization of the first premolars, continuing with the gradual visualization of the second premolars, first and second molars, considering a symmetrical or unsymmetrical smile, related to the size of the buccal corridor or its non-existence.(fig.3)

The special situations, not very few, in which the reconstruction of the quality of smile also comprised the frontal area, underwent a staging following the same protocol, but conditioned by the occlusal status, the anterior guidance influencing in many situations the origination and stages of the treatment. In these situations the exploration and distinction of the possible premature contacts and occlusal interferences at the level of the provisional prosthesis constructions allowed the reassessment and determination of a new vertical size of occlusion corresponding to the post-prosthetic status.

From the specialist point of view, without establishing a hierarchy many times considered

by us as being artificial, the impact of the quality of smile showed a preference for a visualization up to the level of the first molars or partially to the second molars, considering a relatively big buccal corridor, while the presence of a small buccal corridor evaluated the visualization up to the level of the second premolars, taking into account the attractive smile in this situation. Considering a non-existent buccal corridor, it was appreciated that the visualization up to level of the first molars increases the attractiveness of the quality of smile. Analyzing the collected data by gender it was noticed a preference for the visualization up to the level of the second premolars in women and up to the level of the second molars in men.

In terms of the assessment made by the dental technician, this time it was noticed a change of the perception of the quality of smile emphasized by the perception of an attractive smile in women, by the visualization up to the level of the second premolars and up to the level of the second molars in men.

It should be mentioned that the report of the buccal corridor with the visualization of the teeth was more important in choosing the quality of smile than the presence or not of the symmetry. The dental morphology could be influenced in the functional limits permanently taking into consideration the existent occlusal reports. The morphology change of the vestibular sides of teeth associated with the reduction or extension of the cervical-occlusal size experienced both a negative response from the specialist and the dental technician, but in our view received a paradoxically positive response from the patients, considering the perpetuation of the edentulous state over a long period of time, because of the express desire to resolve, without aesthetic demands, the clinical situation and especially because of difficult communication. We can not hide the fact that the training may represent in some situations a major impediment in communicating with the patient. The collaboration with a psychologist was required in these situations.

The assessment of the patients showed a discrepancy between the perception of smile attractiveness of men and women. Reported to the three studied groups, we can say that the source, namely the urban and rural environment, didn't show an evident change of the perception of the quality of smile, but it provided controversial data in our view, regarding the opportunity itself of the treatment to recover the dental arches integrity as a therapeutic option for the patients.

#### Discussions:

The smile line should follow the course given by the incisal edges of the central and lateral maxillary incisors, to which the top of the canines is associated. In compensation, the lower lip should follow the same references. The gingival level should be symmetric, at the same level regarding the central front teeth and canines, while for the lateral maxillary incisors is higher by 1 mm. Concerning the central incisors, the gingival level is at the intersection between the central third to the lateral third, for the central cervical lateral incisors, and concerning the canines it is slightly moved towards the distal [7,8,9]. Our study showed an evenness of the gingival level, often reported at the existing insertion level of the maxillary central incisors. As for the gingival level of the canines it was noticed a redistribution regarding women, who prefer that the line of the central incisors to be followed, while for men it was opted for the slight movement to the distal.

Dental morphology, represented by the length and width of teeth, can also contribute to the harmonization of smile. The upper front teeth lengths are proportional to the body size, with values ranging between 9 and 14 mm, measured from the incisal edge up to the gum, while the mandibular anterior teeth length is between 9 and 10 mm. Women tend to prefer smiles with round and square-round teeth, while men prefer smiles with square teeth [10,11,12]. The ratio between the length and width of the teeth should be of 100:80, as per the best proportion, ratio perceived as aesthetic. The deviations of up to 100:95 and 100:65 are acceptable in terms of aesthetics [13,14,15].

It should be noted that the biological width must be considered in the performance of any prosthetic reconstruction. It is known that the values vary, any clinical situation requiring the achievement of the marginal periodontal protection [16,17,18]. The teeth axes must be inclined slightly incisally and the inclination should remain balanced in the sides. The intentional deviations have the effect of amplifying the tension [19,20]. We noticed, as option for the dental morphology, an independent orientation compared to the advice of the doctor materialized in women, by an option to a vertical position of the dental axes, with a continuation of theirs on the lateral areas, while men prefer a protusion and inclination of the dental axes to the distal.

Also, the tooth color is a factor that can influence the integration of the prosthetic construction in the dental-facial assemble. Color perception is often influenced by the doctor and even the patient when the psycho-emotional component prevails against clinical reality. When choosing the color it should be taken into consideration the type of coloring of the patient, the inclination for warm colors or cold colors, knowing that patients generally tend to prefer the white color, in fact improper to the natural color [21,22]. The overview prosthetic reconstruction offers both the doctor and the patient a relatively high margin of color choice options. Most patients are seeking that the final option to quickly enable a personal reconsideration and then a social one, seeking to "recover" the period considered unaesthetic by forcing and exaggerating the color references.

One of the most controversial aspects belongs to the size of the buccal corridor, defined as the space between the adjacent surface of the jaw's teeth and mouth corners while smiling. The association of the prosthetic

constructions to this goal is a stage in achieving an attractive smile [23,24,25]. Studies demonstrate that the change in viewing the lateral areas allows a reassessment of the perception level of smile [26,27,28].

The impact on smile can be highlighted reporting the existence of the buccal corridor with the measurements of the width of the maxillary frontal group space. It should be noted that any orthodontic treatment as well as the existence of the buccal corridors' asymmetry with the visualization of a large number of teeth contributes to the negative perceptions of the esthetics of smile [29,30,31]. Perception depending on gender or age also constitutes controversies on the size of the buccal corridor and the assessment of the prosthetic reconstruction [32,33]. We can say that prosthetic reconstructions, regardless of their amplitude, should ensure the integration in the discreet dental-facial assembly, any imposed exaggeration causing the opposite effect[34,35].

If for women an attractive smile is perceived with a visualization up to the second premolars, left and right, and maximum up to the first molars, considering a small or medium buccal corridor, for men the perception of smile as being attractive requires a visualization up to the first or second molars, considering a large buccal corridor, without being able to make a clear delimitation between the sexes as an option. It must be noted the possibility of reassessment and facial reconstruction for women by means of embellishment.

The summary of the obtained data allowed the assessment of the quality of smile, making a parallel between the perception of the professional and that of the patient. If for your dentist and dental technician a visualization of the dental structures up to the second or first premolars increases the perception of "beautiful", among the patients the visualization of a maximum of 10 teeth is perceived as satisfactory, few smiles being those that discover a number of 12 teeth. Among them, it was found that women are more sensitive to the changes induced by the exploration of the architecture of smile, which makes that the prosthetic protocol to be more complex, adding to it the color perceived as contributing factor in the aesthetic evolution. The local asymmetry proved that the aesthetic perception is not definitely influenced, but contributes to the general assembly. The chromatic variations require a specific therapeutic behavior related both to the patient's desires, many times

inaccurate, and to the possibilities of the dental technology laboratory. The influence of the final cost of the prosthetic treatment meant actually the decisive stage in the evolution of the esthetic quality performance, which many times made it difficult to establish and stabilize the final result. The necessary changes to emphasize the dental units could be achieved in terms of some provisional prosthetic constructions, achieved by the indirect method. Also, the occlusal factor was many times an obstacle difficult to overcome, proving that the local-regional morphology and physiology finally impose certain limits.

### Conclusions:

Exploring the architecture of smile makes the prosthetic protocol more complex, adding to it the color perceived as contributing factor in the aesthetic evolution.

The prosthetic reconstructions regardless of their amplitude should ensure the integration in the discreet dental-facial assembly, any imposed exaggeration causing the opposite effect.

The occlusal factor is an obstacle difficult to overcome, proving that local-regional morphology and physiology finally impose certain limits.

The individual and group chromatic variations of the dental units positively influence the quality of smile.

The association of the facial cosmetics enhances the aesthetic quality of smile.

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### References:

1. Golstein C. *Imaging in Esthetic Dentistry*, Edn. Chicago: Quintessence Books, 1998. 1-6.
2. Sarver, *The importance of incisor positioning in the esthetic smile: the smile arc*. American Journal of Orthodontics and Dentofacial Orthopedics, 2001, 120 : 98 – 111.
3. Bortă, Burlui, *Studiul clinic cu privire la eșecul din punct de vedere estetic în terapia prin aparate gnatoprotetice conjuncte metalo-ceramice*, Rev. Medicina Stomatologică, 2004, vol. 8, 25-28.
4. Davie S.J., Gray R.J.M., Linden G.J., James JA. *Occlusal considerations in periodontics*. Br Dent. J. 2001, 191:597-604.
5. Ash M. Jr., *Philosophy of Occlusion: Past and Present*. Dent. Clin. North. Am. 1995, 39(2):233-55.
6. Bückin W. *Perpetuat în practică în mod empiric. Lista de verificat în estetica dentară*, Quintessence International Romania, 2009, 3:257-268.

7. Boboc Gh. *Aparatul dento-maxilar: formare și dezvoltare*; ed. a II-a, Ed. Medicală,1996,46,58-63,79-83.
8. Albino J.E., TEDESCO L.A., Conny JD, *Patient perception of dental-facial esthetics. Shared concerns in orthodontics and prosthodontics*. J Prosthet Dent. 1984;52:9.
9. Dunn W.J.,Murchison D.F., Broome J.C., *Esthetics: patients' perceptions of dental attractiveness*. Journal of Prosthodontics,1996,5 : 166 – 171
10. Anderson K. M. , Behrent R G , McKinney T W , Buschang P H *Components of an esthetic smile*. American Journal of Orthodontics and Dentofacial Orthopedics,2005,128 : 458 – 465.
11. Levin E. I., *Dental esthetics and the golden proportion*. Journal of Prosthetic Dentistry,1978, 40 : 244 – 252.
12. Perrett D. I. et al., *Symmetry and human facial attractiveness*. Evolution and Human Behavior 1999,20 : 295 – 307.
13. Preston J. D., *The golden proportion revisited*. Journal of Esthetic Dentistry,1993, 5 : 247 – 251.
14. Rufenacht C.,*Fundamentals of Esthetics*,Quintessence books,1992,5:137-183.
15. Bratu D.,Nussbaum R.,*Bazele clinice și tehnice ale protezării fixe*,Ed. Medicală,2005;1014-1034.
16. Rickett R.M.,*Divine proportion in facial esthetics*,Clin. plast.Surg.,1982,401-422.
17. Waerhang J., *Tissue reactions around artificial crowns*. J Periodontol.,1983;54:172
18. Kois J.C.,*Altering gingival levels*,J. Eshet. Dent.,1994,6,3-9.
19. Tarnow D. P.,*The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental papila*, J.Periodontol,1992,63,995-996.
20. Calandriello M., Carnevale G. Ricci G.,*Parodontology*, Ed. Martina Bologna,1996 20-45, 156-193,549-587.
21. Blitz N. , *Criteria for success in creating beautiful smiles*. Oral Health,1997, 87 : 38 – 42.
22. Shulman J. D. et al., *Perceptions of desirable tooth color among parents, dentists and children*. Journal of the American Dental Association 2004,135 : 595 – 604.
23. Lombardi R.,*The principles of visual perception and their clinical application to denture esthetics*, J.Prosthet. Dent.,1973,29,358.
24. Lombardi R.,*A method for the classification of dental errors in dental esthetics*, J. Prosthet.Dent,1974,32-36,501-506.
25. Shillingburg H.T.et al., *Fundamentals of fixed prosthodontics*,Quintessence books,1991.
26. Matthew T.G.,*The anatomy of a smile*,J.Prosthet.Dent.,1978,128-129.
27. Sarver D.M., Ackerman M.B., *Dynamic smile visualization and quantification-Smile analysis and treatment strategies*.American Journal of Orthodontics and Dentofacial Orthopedics 2003,124 :116 – 127.
28. Moore T.et al.,*Buccal corridors and smile esthetics*. American Journal of Orthodontics and Dentofacial Orthopedics,2005,127 : 208 – 213.
29. Proffit E.G.,*Contemporary orthodontics*,Ed. Mosby,Ed.2,1995.
30. Le Gall et Lauret F. ,*La fonction occlusale [Occlusal Function]*, Ed. CdP,2008,156-245
31. Nunn M, Harrel S.K. ,*The Effect of Occlusal Discrepancies on Periodontitis, part I: Relationship of Initial Occlusal Discrepancies to Initial Clinical Parameters*.,J Periodontol 2001; 72(4):485–94.
32. Mock D.,*The Differential Diagnosis of Temporomandibular Disorders*,J. Orofac Pain 1999,13(4):246-250.
33. Carlson G.E. et al,*An international comparative multicenter study of assessment of dental appearance using-aided image manipulation*,Int. J. Proshodont.,1998,11, 246-254.
34. Dong J.K.,*The esthetics of smile:a review of some recent studies*,Int.J. Proshodont.,1999,11,246-254.
35. Morley J., *Macroesthetic elements of smile design*. Journal of the American Dental Association 2001,132 : 39 – 45.
36. Sergl H.G.,Zetner A., Krause G., *An experimental study of esthetic effect of facial profiles*. Journal of Orofacial Orthopedics,1998,59:116-126.

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