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The gummy smile

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ABSTRACT

A gummy smile is one in which excessive amounts of gingival tissue are revealed as individuals begin to laugh or when they show their teeth in a smile.

In addition to cosmetic methods of concealing this condition, a variety of orthodontic and surgical procedures can, independently or in conjunction, modify the structural elements that constitute a gummy smile.

Nevertheless marked gummy smiles are always characterized by specific dento-maxillary discrepancies, a global vertical maxillary excess or overdevelopment of the alveolar processes, the premaxilla and the proalveolus constituting excess anterior vertical dimension. For each of these instances, the author proposes therapeutic treatment plans and illustrates them with corresponding clinical cases.

KEY WORDS

Osteotomy,

Gummy smile,

Premaxilla,

Proalveolus.

1 – INTRODUCTION

The smile is an important component of an individual's attractiveness and socialization capability in our modern communication dominated society. It is a central element in the expression of the face. An analysis of the smile can be made by assessing the ensemble of its elements at rest and in movement.

The dilating muscles of the orbicularis oris of the lips provide the force that activates the smile. In the crescendo of the mobilization of these muscles an examiner can distinguish different stages of the smile from the pre-smile to the pre-laugh both having passed through the dento-labial grin[4]. It is during these last two

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phases of the smile that the lips open displaying excessive amounts of gingiva in the case of a gummy smile.

In a clinical study of the face in movement and at rest the examiner can attribute the parts of the smile to the elements that make it up, soft tissue and the osseous base. However, it the case of a smile that is severely ''gummy'' the osseous component, though not visible, is always present. From a schematic point of view the three principal elements of a gummy smile are excess maxillary vertical dimension, which is primarily a result of over-development of the alveolar processes, the premaxilla, and, finally, excess anterior vertical height.

2 – EXCESS MAXILLARY HEIGHT (an over-development of the alveolar processes)

The gummy smile anomaly is primarily a consequence of a maxillary default whose correction requires a global impaction of the upper jaw[2]. This procedure must be performed with exquisite care because the posture of the pterygoid processes is unfavorable (fig. 1) and the surgeon must resect them while laying back palatal pedicle flaps. Secondary hemorrhages are the principal risk if the flaps are not prepared correctly during the operation. If surgeons have to impact the maxilla to a considerable extent they may have to perform, in extreme cases, bilateral inferior turbinectomies to avoid impairing the permeability of the nostrils. This means

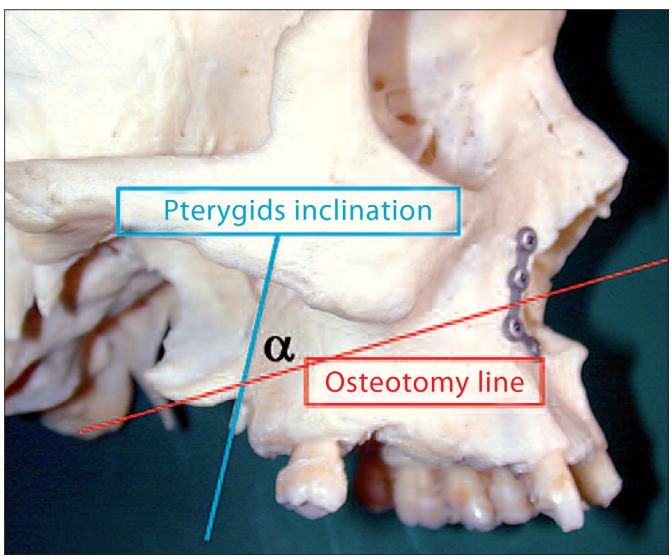


Figure 1
The angle alpha formed between the line of the Lefort 1 osteotomy and the inclination of the pterygoid processes makes posterior maxillary impactions difficult to execute. Pterygids inclination Osteotomy line

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that in improving the esthetics of the smile surgeons may sometimes impair the appearance of the nose[1].

• Clinical case 1

A 36 year-old female patient with no significant previous history consulted us for correction of her gummy smile. We noted in our clinical and radiological analysis that her teeth were in Angle Class I occlusion, an excess of maxillary dimension, a closed naso-labial angle of 90° at rest (compared to a normal in females of 95 to 110°), and a short upper lip that made lip closure at rest difficult (fig. 2).

To resolve these discrepancies, we proposed a global maxillary impaction of 7 mm associated with an advancement and reshaping genioplasty to



Figure 2a and 2b
First clinical case.

Before. *a: gummy smile caused by excess development of the alveolar processes. The upper lip is short and the naso-labial angle is closed.*

After. *b: post-operative result, after a Lefort 1 osteotomy with 7 mm global impaction of the maxilla and a genioplasty. The appearance of the nose has worsened as a result of widening of the nostril tips and further closure of the naso-labial angle.*

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Figures 3a and 3b
First clinical case.

***Before**. a*
***After**. b: a rhinoplasty has opened the naso-labial angle and reduced the spread of the nostrils.*

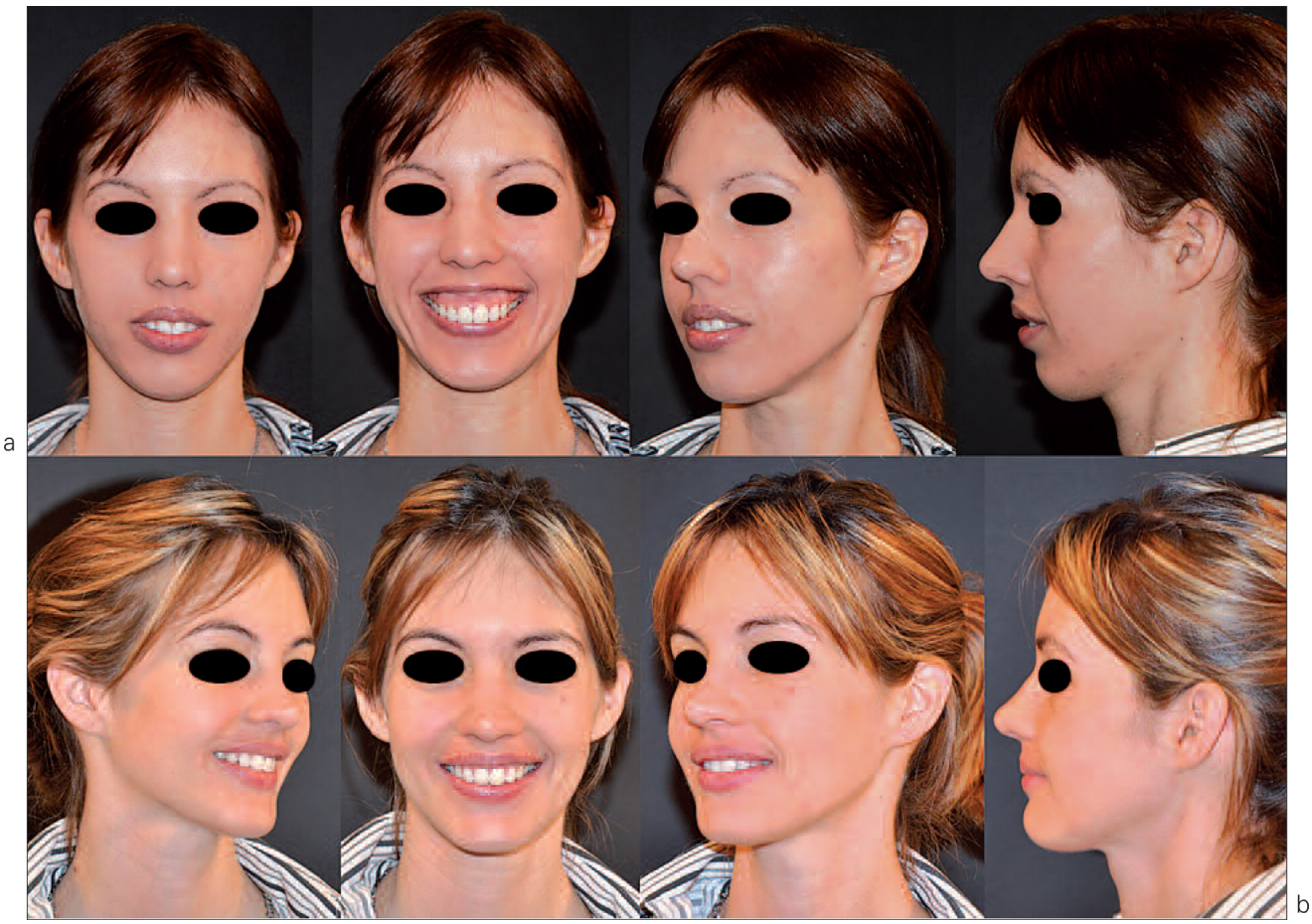
improve her profile. We warned her that the operation would have an unfavorable effect on the appearance of her nose, further closing the naso-labial angle and enlarging the wings of the nostrils (fig. 2).

We envisioned an eventual need for a secondary rhinoplasty from the first stages of our consultation with this patient and she had this procedure a year after our operative intervention to correct the gummy smile (fig. 3)

• Clinical case 2

A 24 year-old female dental assistant, with no significant clinical history, asked us in her consultation to improve her facial appearance. On clinical examination we found lip incompetence at rest, a low and retruded menton, and a naso-labial angle over 110°, the upper limit of normal for females. Her teeth were in Angle Class I occlusion. Our cephalometric analysis confirmed

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Figures 4a and 4b
***Before**. a: lip incompetence at rest; chin low and retruded, naso-labial angle higher than 110°.*
***After**. b: a Lefort 1 global impaction osteotomy and genioplasty have been performed.*

our impression that her gummy smile was caused by both over-development of her upper alveolar processes and the mandibular retrusion.

As in the first clinical case, our treatment plan consisted of a global impaction of the maxilla accompanied by an advancement genioplasty. But in this case the high naso-labial angle indicated the maxillary impaction would have a favorable effect on the appearance of the nose (fig. 4).

3 – THE PREMAXILLA

On clinical examination we noted this patient's profile was characterized by a closed naso-labial angle and a tendency toward Angle Class II occlusion.

Our cephalometric analysis confirmed our impression of a premaxilla with an open c1/cf 1 angle in the Delaire analysis[7] and a more than

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normal maxillary length (Chateau), which is the distance between point T, maxillary tuberosity that represents the intersection of the bispinal plane with the pterygo-maxillary fissure and point A. In adults this is a relatively stable length of 52 mm.

Therapeutically, we judged that an orthodontics only solution accompanied by removal of the maxillary first bicuspids to provide space for retraction of anterior teeth would not be adequate for achievement of satisfactory amelioration of the profile.

Instead, we determined that a more complicated surgical approach would be required for this patient as it is for many others. The necessary procedures include a Lefort 1 retrusion osteotomy[5,6,9] often with a segmented retraction of the upper anterior teeth[3,8,10]. And to maintain facial equilibrium the complimentary operations of genioplasty and rhinoplasty are often needed.

We illustrate these procedures in the next two cases.

• Clinical case 3

A 42 year-old female patient, with no significant clinical history, showed a protrusion of the premaxilla, a Class II occlusion, lip incompetence, excess vertical dimension, and a retruded chin.

Her naso-labial angle was closed at about 90° (fig. 5), which is about 5° below the lower normal limit.

After Dr. Michel Lanacastet aligned the dental arches orthodontically, we performed a Lefort 1 impaction and retraction osteotomy accompanied by a sagittal mandibular advancement osteotomy to place her teeth in Class I occlusion (fig. 5). In a final procedure, we performed a genioplasty to complete the successful esthetic transformation of her profile.

• Clinical case 4

A 36 year-old patient consulted us for surgical correction of her Class II malocclusion. Examination revealed protruded maxilla and upper alveolar process that had been partially corrected by previous orthodontic treatment. She had a gummy smile with an upper protrusion and a closed naso-labial angle (fig. 9). She was missing many teeth, notably the upper premolars (fig. 7).

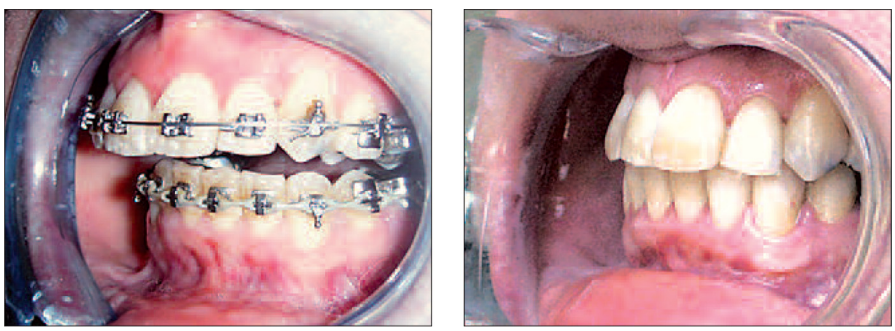
Our treatment plan, based on the usual orthodontic records plus a set-up of the planned result placed on an articulator (fig. 8) was to use an osteotomy to retrude the anterior segment of the maxilla into the space made available by the missing bicuspids.

This would be supplemented by an advancement genioplasty to balance the complete Wassmund maxillary procedure. Sometime after these operations Dr. Alan Desaubaux placed a full maxillary bridge that served not only to greatly improve facial esthetics but also to act as a fixed retainer for the surgical retraction of the premaxilla (fig. 9). The retruded anterior sector would otherwise have been at risk of relapse from tongue pressure as sometimes happens after treatment of protrusion in patients of certain ethnic groups. It would seem that her bridgework would protect this patient from that eventuality but she was nevertheless informed of the possibility.

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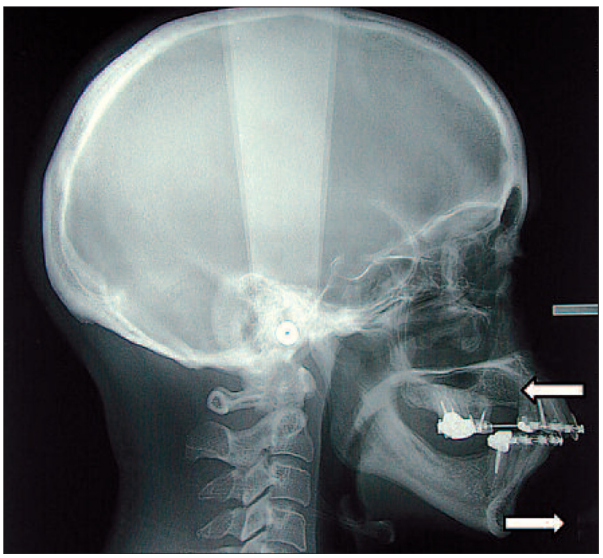


Figures 5a and 5b
Clinical case 3.
Before. *a: lip incompetence, maxillary protrusion; closed naso-labial angle below 90° and retruded chin.*
After. *b: Lefort 1 three mm maxillary retrusion with impaction completed by a sagittal mandibular advancement osteotomy and genioplasty.*

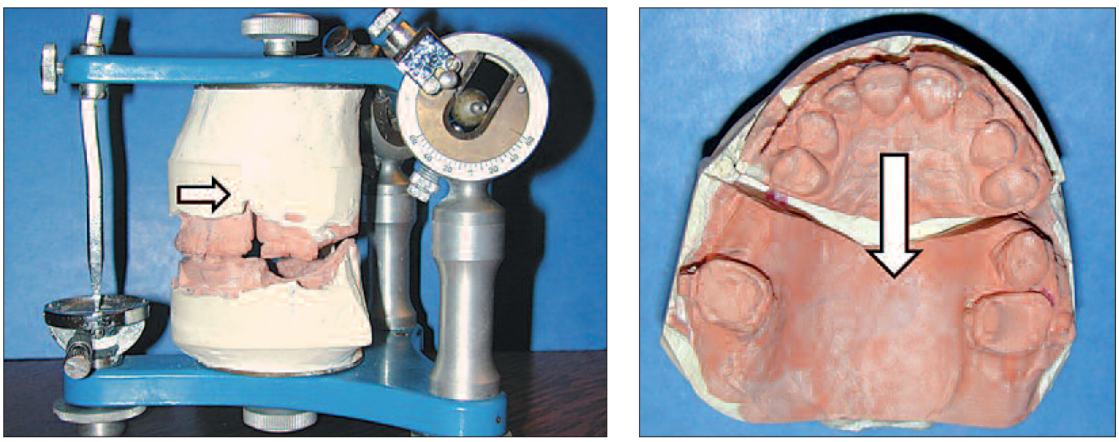


Figures 6a and 6b
Clinical case 3.
Before. *a: Dr. Michel Lanacastet is aligning the teeth orthodontically.*
After. *b: A class I occlusion has been obtained.*

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Figures 7



a b

Figures 8a and 8b
Clinical case 4.
Simulation on articulated models of the planned segmented anterior retraction osteotomy. A surgical splint was prepared from this set-up to guide the surgeon in carrying out the procedure.

4 – PROTRUSION OF THE UPPER ALVEOLAR PROCESS AND EXCESS OF ANTERIOR VERTICAL DIMENSION

Protruded positioning of the upper alveolar process and excess anterior vertical dimension are the most frequent causes of gummy smiles. Orthodontic treatment accompanied by removal of maxillary premolars does not suffice to correct the condition and may, in fact, aggravate it.

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Figure 9a and 9b
Clinical case 4.

Before. *a: upper protrusion with closure of the naso-labial angle of about 30^0. Orthodontic treatment by Dr. Ho Vo Tuan Giao.*

After. *b: partial correction of the gummy smile after Wassmund osteotomy with opening of the naso-labial angle, correction of the protrusion, and forward positioning of the chin.*

Orthognathic surgery with impaction of the anterior segment of the maxilla was required to resolve the problem in this case.

• Clinical case 5

A 25 year-old female patient consulted us for correction of her gummy smile that was characterized by excess anterior vertical dimension. She had a Class II, ethnically related bi-maxillary protrusion that Dr.Laurence Leloup treated orthodontically in a plan that included extraction of first bicuspid teeth. After alignment of the teeth had been completed a Class II occlusion was, as planned, still present (fig. 10).

The anterior overbite and gummy smile were pronounced. Her naso-labial angle was within normal limits at 100° (normal for females being 95 to 110°). The low placement of her nostrils made these orifices excessively visible.

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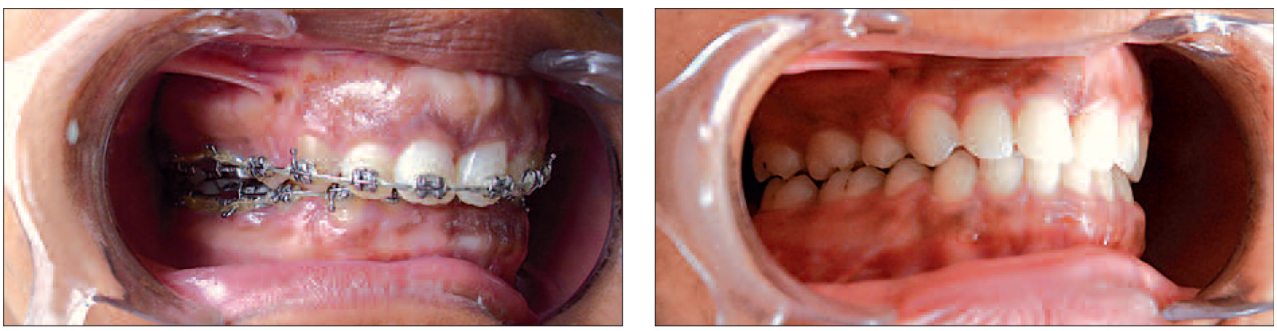


a

Figures 10a and 10b
Clinical case 5.

Before. *a: gummy smile associated with excess anterior vertical dimension that remained after orthodontic correction of the bimaxillary protrusion. The nasal orifices are low and highly visible in a frontal facial view.*

After. *b: eight mm impaction anterior Lefort 1 osteotomy complimented by a sagittal mandibular advancement osteotomy. The orientation of the nostrils has been corrected.*



a b

Figures 11a and 11b
Clinical case 5.

Before. *a: class II occlusion with anterior overbite after removal of all four first bicuspids and pre-surgical orthodontic alignment of the teeth by Dr. Laurence Leloup.*

After. *b: a class I occlusion has been obtained and the overbite corrected.*

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The Lefort 1 osteotomy with 8 mm impaction of the anterior segment of the maxilla complimented by a sagittal mandibular advancement osteotomy of the mandible corrected the gummy smile (fig. 10) and the Class II relationship (fig. 11). A supplementary procedure on the lower part of the nasal septum attenuated the effect of the maxillary impaction on the naso-labial angle.

But this impaction had the favorable effect or raising the wings of the nose thus reducing the opening of the nostrils thereby enhancing facial esthetics.

5 – CONCLUSION

Management of gummy smiles, as we have shown with the clinical cases presented in this article requires a global, multi-disciplinary approach. Preliminary dental and cephalometric analyses are essential but an esthetic analysis, taking ethnic characteristics into account, is also required. The results that can be obtained are a compromise between the goals formulated by the various examinations and analyses and the therapeutic modalities that are at our disposal. These include orthodontics and maxillofacial and plastic surgery as well as cosmetic and prosthetic dentistry.

In an overall view these are the guidelines that must be kept in mind:

- orthodontic treatment alone, except in cases of very minor discrepancy, is seldom capable of resolving the problem unaided;
- a lengthening of the upper lip by plastic surgery is always considered and, in treatment of minimum discrepancy cases, may, together with orthodontic therapy, be sufficient;
- when orthognathic surgery is indicated it will always be aimed at the upper jaw to accomplish impaction and/or retraction of the premaxilla. Various techniques are appropriate including Lefort 1 and segmented anterior retraction;
- to obtain definitive esthetic and functional results a number of complimentary procedures can be indispensable including sagittal advancement osteotomy, genioplasty, and rhinoplasty.

By carefully listening to patients during their preliminary consultation appointments practitioners can discern principal complaints and objectives of patients that might not be appropriate to the real nature of the problem. For example patients might ask, ''Doctor, can you do something about my long teeth'' without realizing that correction of their smiles may require far more than a simple dental intervention, often involving one or more surgical procedures.

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