

New diagnostic methods for smile designing

Practitioners use a combination of clinical smile design principles and artistic judgments to provide a natural and pleasing appearance for the patient's newly restored smile. Among those Smile Design principles, Golden Proportion, gingival architecture, emergence profile, and shape of teeth related or not to facial anatomy are used to project or redefine the patient's esthetic smile. None of those principals can solve the frequent asymmetries of the smile and the face, so it seems necessary to define a new method to diagnose and project new smiles. This article describes the nature and the scientific bases of the so-called "M Ruler", a diagnostic tool for smile design using an algorithm based on both upper centrals width and the diameter of the patient's maxillary complex width will give the ideal disposition of teeth in the maxillary and the patient's face. The "M Ruler" is the base of a specific computer program (Dental GPS, Laval CANADA) used to diagnose and project new smiles for patients. The steps of this innovative approach established in 2005 are discussed.

Many diagnostic tools (X rays, CT Scans, models, imaging, photography, intraoral cameras...) are available in dentistry to help practitioners to evaluate and diagnose diseases, decays, malocclusion or anomalies. Many specific diagnostic devices guide clinics (dentists) in their interpretation of data and their diagnosis, but none of those devices are related to Smile Design. For esthetic treatments, subjective judgment based on the personal esthetic sense lead to a variety of treatment plans offered by different practitioners, which can be confusing for the patient.

The subjectivity makes it difficult to establish clear-cut subjective goals for diagnosis and treatment planning. Although rules that define esthetics rigidly might be difficult to determine, it is possible to formulate general guidelines to optimize dentofacial esthetics ¹

The esthetic interpretation and judgment of the practitioners is a barrier in delivering the proper appearance for each patient. Using a Digital Smile Design Diagnostic Device at the consultation will guide the dental practitioner to establish a pre diagnosis and discuss about different possibilities of treatments. With further information confirmed with a more detailed examination of the patient with X-Rays, it is possible to show different treatment plans with the final appearance of the future dental treatments.

This article will demonstrate the accuracy of the "M ruler" as a first step to diagnose and to guide smile design using a symmetrical algorithm based device calibrated with the upper central width and the width of the patient's maxillary complex. This will show the ideal setup of teeth over the picture of the patient's face. Treatments are guided simply by using a single facial photograph in conjunction with computer software to guide a 2D wax up on computer screens.

The Key: Taking a good facial picture with a nice smile

It must be understood that "every object can be subject to apparent deformation in geometric shape whenever observed from certain positions. These deformations result from two types of phenomena: (1) the effect of perspective and (2) the effect of optical illusion. Though they seem to show specific properties, one is aesthetic, the other scientific, a precise distinction between these two phenomena is difficult to establish. When using two dimensions to study a three-dimensional subject, there is two majors concerns: the distance and the angulations between the observer and the subject. It is therefore crucial to take the photograph directly in front of the subject demonstrating a full natural smile at a focal distance of 1:10. ²

It must be understood that the photo is taken without distortion due to angulations either horizontally or vertically.

To make a proper evaluation of the smile and its harmony within the patient's face, the first step is to take a very good quality picture of the patient face demonstrating a full natural smile. A smile design should always include the evaluation and analysis of both facial and dental composition. ³

Several parameters are available to assess smile esthetics, such as amount of gingival display, midline, buccal corridor, incisor width/height ratio, incisor crown inclination, gingival contour, and smile arch appearance. ⁴ To assure that the smile design complies most of the requirements to assess a comprehensive treatment plan, most of those parameters must be evident in the patient digital photograph to be accurately evaluated.

The frontal view of the patient's face helps the clinician to evaluate the relation between the smile and the general symmetry of the face itself. ⁵ The position of the patient's head will influence the precision of the analysis and its transfer to the laboratory for the production of the wax up on patient's model.

The position of the patient's face in the frontal view on the facial photograph will be influenced by the 3 following criteria so called the No, the Yes and the Maybe by Dr Methot:

The No = the movement of the head left or right on the picture will locate the **Yaw** on the model in the lab

The Yes = the movement of the head up and down on the picture will locate the **Pitch** of the model in the lab

The Maybe = the canting the head on the left or the right on the picture will locate the **Roll** of the model in the lab

The No

When the facial picture is used to diagnose, plan and realize the lab work, the Yaw of the picture become critical for the esthetic diagnosis and is important to ensure accuracy in the subsequent lab work. ⁶

If the patient turns the head left or right on a 2D picture, it will affect the **Yaw** and the diagnosis at the same time. This could lead to non-proportional dimensions of the teeth on the left or right side and asymmetrical issues with the facial midline (**Figure 1,2**).

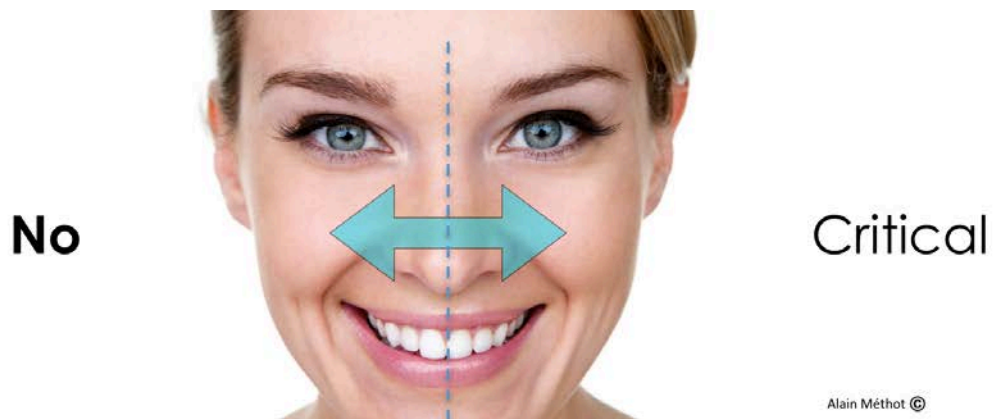


Figure 1 The No (Yaw) is critical in the digital system: if the picture is not taken correctly, the frontal view will mislead the esthetic diagnosis.



Figure 2 The two ear lobes and the temples must appear equal on each side while taking the picture.

The Yes

Will affect the **Pitch** of the occlusal plane. The antero-posterior orientation of the maxillary occlusal plane has an important role in the creation, assessment, and perception of an esthetic smile. **7**

The Frankfurt Plane has an angulation of 10-14 degree from the floor and will give a steep Pitch of the occlusal plane on the articulator or a 3D system. (The Frankfurt Plane is more used in Europe) **8 (Figure 3)**

The Esthetic Plane has an angulation of 6-10 degree from the floor; it will give a more adequate Pitch of the occlusal Plane for the lab work.

The Camper Plane has an angulation of 0-6 degree from the floor and will give a flat Pitch. In this case the transmission of the exact Pitch from picture to the lab maybe problematic because lips are hiding the posterior teeth (This plane is more used in North America) **(Figure 4)**.

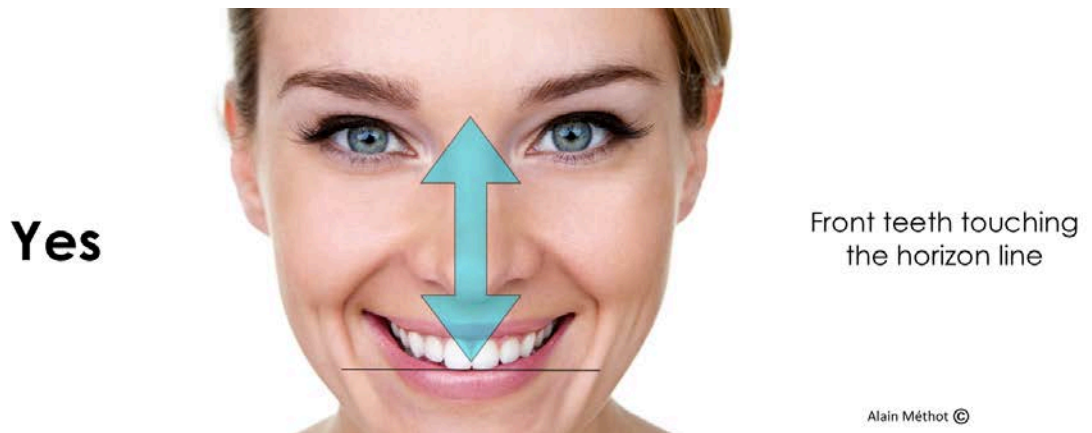


Figure 3 The Yes (Pitch), is taken with the patient looking at the horizon

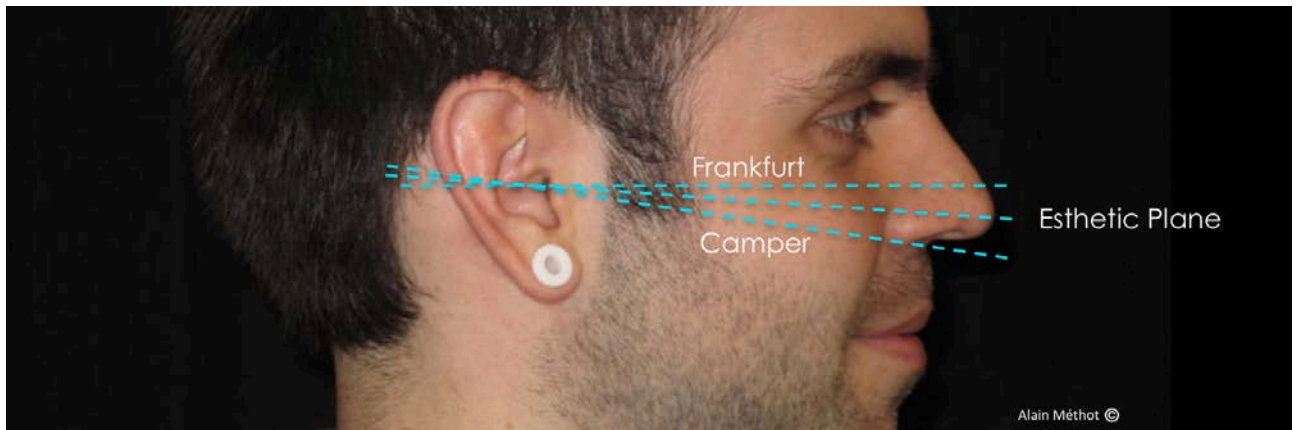


Figure 4 The Yes (Pitch), is ideally taken with the esthetic plane parallel to the floor

The Maybe

Is connected with the **Roll** of the incisal or occlusal plane (**Figure 5**). Normally, the incisal line of an esthetic smile should be parallel to the upper lip (some exception may occur if patients has filler in the upper lip or Botox in the region). If the face is symmetrical, the dental midline should correspond to the facial midline, and the facial midline should be perpendicular to the incisal plane and the upper lip.



Figure 5 The Maybe (Roll); is easily corrected by rotating the digital picture

Bibliography

1. Brian J. Schabel,^a Lorenzo Franchi,^b Tiziano Baccetti,^b and James A. McNamara, Jr(Subjective vs objective evaluations of smile esthetics . *Am J Orthod Dentofacial Orthop* 2009;135:S72-9
2. Rufenacht CR Principles of esthetic integration. Quintessence Pub Co.Inc., 2000
3. Sudhakar M, Vishwanath A. Smile Esthetics – A Literature Review. *IOSR Journal of Dental and Medical Sciences* Vol 13 No 1 Ver. IV (Jan. 2014), PP 32-36
4. Suzuki L, Machado A, Bittencourt M. An evaluation of the influence of gingival display level in the smile esthetics. *Dental Press J Orthod.* Vol 2011 Sept-Oct;16(5):37.e1-10

5. Ahmad I. Anterior dental aesthetics: Facial perspective. *British Dental Journal* 2005; 199: 15-21
6. Methot A. Springing from Diagnosis: Photographic diagnosis and treatment planning. *Journal of Cosmetic Dentistry* Vol 28 No1 Spring 2012:114-124
7. Kattadiyil MT, Goodacre CJ, Naylor WP, Maveli TC. Esthetic smile preferences and the orientation of the maxillary occlusal plane. *J Prosthet Dent.* 2012 Dec; 108(6): 354-61.
8. Levin JB. Esthetic diagnosis. *Current Opinion in Cosmetic Dentistry, Current Science* 1995: 9–17.