

Interdisciplinary approach in aesthetic dentistry

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Introduction

In today's dentistry, for rendering the best comprehensive dental services to our aesthetically driven patients, the paradigm has shifted to an interdisciplinary team of specialists that work together steered by a clinical co-ordinator. This person should be either a multi-competence general dentist or a specialist with additional training outside his or her specialty area. This gives him or her the ability to bring the surgical, orthodontic, restorative and technical teams together as a whole, following treatment sequences customised especially for the patients' best interests and expectations.

The challenge is making the correct diagnosis and selecting the appropriate treatment regimen. In order to achieve that, the clinician has to follow certain guidelines and understand the relations between teeth and the adjacent structures. Establishing the correct position of the incisal edge of a maxillary central incisor in relation to the lower lip, the correct ratios between the tooth's width and length, and the level of gingival margin when smiling are very powerful diagnostic tools.

In order to aid memory, one may remember it as the 42.2 rule: (a) a maximum of 4 mm of maxillary central incisor display when the lips are at rest (a minimum of 2 mm; Fig. 1); (b) a maximum of 2 mm of gingival display during smiling; (c) a maximum of 2 mm from the incisal edge of the maxillary central incisor to the lower lip during smiling (Figs. 2 & 3); and

(d) the middle third of the maxillary central incisor should be perpendicular to the occlusal plane and the incisal edge should touch the plane (± 0.5 mm; Fig. 4).

The correct ratio between the width and length of a maxillary central incisor is 78 to 80 per cent. With the incisal edge position already determined, we can identify the position of the gingival margin (Figs. 5 & 6).

Gingival margin positioning should be in accordance with the understanding of six conditions present in the oral cavity with different aetiologies and treatment regimens:

1. Altered passive eruption when the gingival margin does not recede to a level near the cemento-enamel junction (CEJ) during tooth eruption. Diagnostically, the gingival margin is located incisal to the CEJ. Treatment options depend on the amount of attached gingiva and the position of the bone relative to the CEJ (as a general rule, the biologic width should be a minimum of 2 mm):
 - (a) gingivectomy;
 - (b) osseous resection (osteotomy) with or without flap surgery (without a flap, it is difficult to control the osseous contour driven by the new gingival margin);
 - (c) apically repositioned flap.
2. Altered active eruption when the osseous crest does not resorb to a level 2 mm apical to the CEJ. The gingival margin is still located incisal to the CEJ. This is treated with periodontal surgery with osseous resection.
3. Compensatory eruption when the tooth surface is lost, with the reduction in facial height or vertical dimension of occlusion unaffected (short tooth syndrome). Treatment is either restorative or, in the case of hypermobility of the lip, combined with a coronally positioned mucosal flap.
4. Delayed eruption followed by early loss of primary

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Figure 1: The level of the maxillary central incisors in the relaxed position (2–4 mm in women and 1–2 mm in men).



Figure 2: A maximum of 2 mm from the incisal edge to the lower lip during smiling, example 1.



Figure 3: A maximum of 2 mm from the incisal edge to the lower lip during smiling, example 2.



Figure 4: The middle third of the maxillary central incisor should be perpendicular to the occlusal plane.

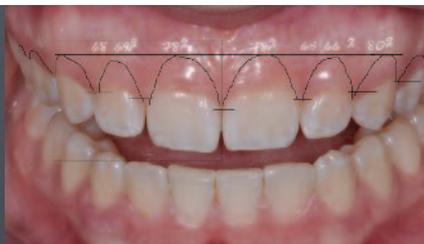


Figure 5: Evaluating width to length ratios.



Figure 6: Altered passive eruption. The enamel could be exposed by a gingivectomy in one appointment.

maxillary incisors, delayed eruption of maxillary permanent incisors or overeruption of mandibular incisors. Diagnostic features are short maxillary incisors, over-erupted mandibular incisors or a Class III maxillomandibular relation. Bearing the 42.2 rule in mind, treatment should follow incisal reduction done selectively with crown lengthening only or crown lengthening combined with orthodontic intrusion of mandibular incisors and possible minimally invasive restoration of maxillary teeth.

5. Vertical maxillary excess described as a hyperplastic growth of the maxillary skeletal base where teeth are positioned farther from the skeletal base, an increased facial lower third and excessive gingival display, which is classified according to three categories:
 - (a) Category 1: 2–4 mm of gingival display, treated with only orthodontic intrusion, orthodontics and periodontics, or periodontics with restorative therapy;
 - (b) Category 2: 4–8 mm of gingival display, treated with periodontics and restorative or orthognathic surgery (Le Fort type I); and(c) Category 3: more than 8 mm of gingival display, treated with orthognathic surgery with or without periodontal and restorative treatment.
6. Hypermobile upper lip—the average mobility of the upper lip is from 6 to 8 mm from the rest position. More than 8 mm represents hypermobility. Considering that the average distance from the lower margin of the upper lip and the base of the nose (subnasion) is 21 mm, one could take two superimposed photographs with the patient at rest and the patient smiling fully to calculate the lip

mobility very easily using the 42.2 rule. Generally normal tooth length is present and dental labial aesthetics is good to ideal.

The treatment regimen could entail a coronally positioned mucosal flap, crown lengthening with osseous resection or a combination of both (Figs. 8 & 9)

Example: Photographs captured at the same magnification opened in Adobe Photoshop:

Picture 10: Full smile—length of the central exposed – measure digitally in pixels distance from incisal edge to the lower margin of the upper lip in full smile.

Picture 11: Lips at rest – 2 mm central incisor reveal + 21mm distance lower lip to base of the nose. Incisal edge to base of the nose 23 mm (incisal edge at the correct position).

x = distance from the incisal edge to the lower margin of the upper lip in full smile

y = the amount of central incisor exposed at rest

$23 \text{ mm} = 1,725 \text{ px}$; $x = 900 \text{ px}$; mobility = $x - y$; = $[(23 \times 900) / 1,725] - 2 \text{ mm}$; = $12 \text{ mm} - 2 \text{ mm}$; = 10 mm

(Figs. 10–12)

Since the aetiology is generally multifactorial, by combining all the clinical data gathered during the initial examination, including facial, periodontal, orthodontic, endodontic and restorative data, as well as radiographs and diagnostic photographs, the clinician has the ability to compose a very detailed and comprehensive treatment plan especially for a patient with high aesthetic demands.

Following the digitally designed smile concept, balancing the relations between the teeth and adjacent structures will



Figure 7: Lower third smile showing altered passive eruption.

Figure 8: Delayed eruption.

Figure 9: A hypermobile lip and a slight vertical maxillary excess.



Figure 10: Lower third full smile design.

Figure 11: Relaxed position (m/ sound – ahhh).

Figure 12: Superimposed photographs 10 & 11. The red arrow indicates the distance from the incisal edge to the upper lip in the relaxed position. The yellow arrow indicates the height of the upper lip in the (~ 21 mm). The white arrow indicates mobility of the upper lip from the relaxed to smile position.

help the clinical co-ordinator and the specialty team propose treatment planning to the patient. Presenting the plan in Keynote (Apple) or Microsoft PowerPoint is a very powerful communication tool in obtaining treatment acceptance.

Case presentation

A 32-year-old female patient came to the dental office with her chief complaints being short teeth, an uncomfortable bite, too much gingiva showing when smiling, brown-coloured areas of her teeth and insufficient contact points. The patient was in good general health with a good periodontal status and probing depths of 2 to 3 mm. The aetiology of the excessive gingival display was multifactorial, a combination of delayed eruption, altered passive eruption and hypermobility of the upper lip. From an evaluation of the teeth, both clinically and from the diagnostic photographs, we made the findings given in Table 1 in order of importance (Figs. 13 & 14). We placed incisal edge position first in order of importance because, in the majority of cases, without proper placement whatever follows could

result in a tooth that tries to mimic nature but is not properly exposed in a full smile.

Based on the data gathered, the treatment plan was then presented to the patient in 3-D on models mounted in the articulator and in 2-D with a Keynote presentation, allowing her to understand the present situation, treatment proposed and simulated final outcome.

Following the treatment proposal and acceptance, the case was sent to the dental laboratory, where the dental ceramist fabricated a wax-up and a stone model based on the clinician's diagnostic findings (Figs. 15–17). A crown-lengthening surgical guide (a vacuum-formed Essix appliance) was manufactured on a duplicate model of the wax-up for ideal osseous contouring during the surgical procedure (Fig. 18). The gingivectomy was performed following exactly the gingival margin of the wax-up and then used for guiding the osseous contouring, through which a



Figure 13: Initial lower third when smiling.



Figure 14: Findings in order of importance after establishing the incisal edge position on the full smile photograph.



Figure 15: The wax-up duplicated in a stone model.



Figure 16: The new design proposal in wax.



Figure 17: Very good communication with the dental laboratory.



Figure 18: The crown-lengthening surgical guide.



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Figures 19–24: Crown lengthening with osseous contouring. (Surgery performed by Dr Muriel Krischek, Belgium.)

biologic width of a minimum of 2 mm was maintained (Figs. 19–24).

The mock-up should be placed before the surgical appointment for an initial evaluation and then ideally six to eight weeks post-crown lengthening. If done earlier, a very well-adapted indirect acrylic prototype would be advised or the utmost care in adaptation of the bis-acrylic resin (Figs. 25–27).

For the ultimate control and when time management in a private office is not an issue, the osseous contouring is performed and the flap is closed, followed by guided gingivectomy and mock-up placement at the next appointment in two to three months' time. With this approach, the risk of recession or invasion of biologic width is reduced to the minimum.

Table 1: Findings

Incisal edge position	Missing
Form	Missing
Value	Missing
Surface texture	Missing
Translucency	Missing
Chroma	Missing
Hue	Present
Gummy smile evaluation	Missing
Teeth ratios	Missing
Contact points	Missing
Occlusal interferences	Present



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Figures 25–27: The bis-acrylic prototype.

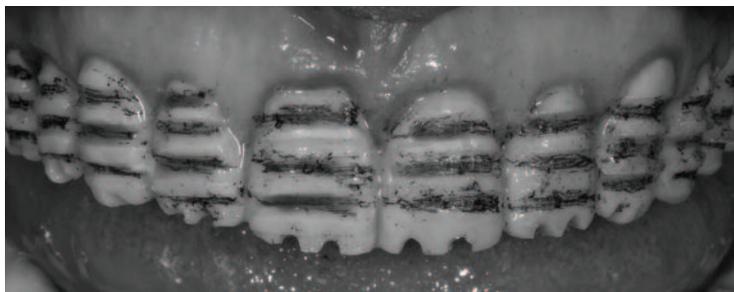


Figure 28: Controlled tooth reduction.



Figure 29: Tooth preparation.



Figure 30: Porcelain restorations on alveolar models.



Figure 31: The try-in paste and organiser.



Figure 32: Cementation.



Figure 33: Situation before.



Figure 34: Situation after. (Ceramics performed by Edwing Chung, Canada.)

Controlled tooth preparation was performed through the mock-up using 0.6 mm depth-gauge burs (Figs. 28 & 29). In designing restorations, the diagnosis of the initial situation and underlying tooth structure, the new design proposal and the patient's expectations play a very important role.

The material of choice in this case was feldspathic porcelain (VITA Zahnfabrik) on a refractory die in the anterior zone combined with pressed lithium disilicate (IPS e.max, Ivoclar Vivadent) in the posterior zone (Figs. 30–33). As a rule of thumb, when a material like feldspathic porcelain is

used, which filters the light through to the underlying structure, a space of 0.2–0.3 mm is needed per shade change. The restorations were adhesively cemented using a total-etch technique and initially tried in with a translucent try-in paste (CHOICE 2, BISCO, Inc.). The occlusion was checked after cementation and a processed acrylic night guard was delivered two weeks post-operatively. The final result is shown in Figures 34, 36 & 37).

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Figure 35: Initial situation.



Figure 36: Situation



Figure 37: Final result.