MiCD: Do no harm cosmetic dentistry—Part I

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The demand for cosmetic dentistry is a growing trend globally. Increased media coverage, the availability of free online information and the improved economic status of the general public has led to a dramatic increase in patients’ aesthetic expectations, desires and demands. Today, a glowing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous; hence, many general practitioners are now being forced to incorporate various aesthetic and cosmetic dental treatment modalities into their daily practices to meet the growing demand of patients.

Cosmetic dentistry is a science-based art guided by the desire of the patient. Many young clinicians who plan to incorporate it into their practice are confused about what they and their patients actually wish to achieve. It is to be noted that the treatment modalities of any health care service should be aimed at the establishment of health and the conservation of the human body with its natural function and aesthetics. However, it is worrying to note that the treatment philosophy and technique adopted by many cosmetic dentists around the world tend towards macro-invasive protocols, and millions of healthy teeth are aggressively prepared each year for the sake of creating beautiful smiles.

The practice philosophy adopted by the clinic and the professional team members generally guides the overall output of the practice. Minimally invasive cosmetic dentistry (MiCD), a do no harm practice philosophy, has four fundamental components: level of care, quality of operator (dentist), protocol adopted and technology selected, which must all be re-evaluated in daily clinical practice. Adopting this holistic medical science practice philosophy is not an easy task, as it requires a change in the mindset of professionals.

In Parts I and II, I explain MiCD, do no harm cosmetic dentistry, based on my Vedic Smile concept, which I have been practising successfully in Nepal for the last 20 years, andadvocating globally since 2009 as the MiCD global mission. It is to be noted that both parts are based on fundamental science (truth and available evidence), clinical experience and the common sense required in holistic dentistry.

Cosmetic dentistry, a global trend
The prevalence and severity of dental decay have been declining over the last decades in many developed countries and this trend is shifting towards developing countries as well. With increased media coverage, the availability of free online information, public awareness has fuelled the demand for cosmetic dentistry globally. Now, a glowing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous.1 The population of beauty- and oral health-conscious people is increasing every year and data from various sources shows that the coming generations of children, especially from the middle-class to higher-income population, will have fewer decayed teeth and will need less complex restorative dental care as they age. These changing patterns of dental care needs will bring about a major shift in the nature of dental services from traditional restorative care to cosmetic and preventive services.

The increased market demand for smile aesthetics among patients is forcing general practitioners of today to incorporate the art and science of cosmetic dentistry into their practice. Cosmetic dentistry is not yet recognised as a separate clinical specialty like orthodontics, periodontics or paediatric dentistry. Cosmetic dentistry is synonymous with multidisciplinary dentistry, as its success and failure are related to the patient’s psychology, health, function and aesthetics. Ethical, high-standard cosmetic dentistry skill training of clinicians is essential for the increased global market of cosmetic dentistry and its promotion. It is widely seen that the treatment modalities of contemporary cosmetic dentistry are tending towards more-invasive procedures with an over-utilisation of full crowns, bridges, dentine veneers, and invasive periodontal aesthetic surgery, while neglecting long-term oral health, actual aesthetic needs and the characteristics of the patient.2 These aggressive treatment modalities are indirectly degrading social trust in dentistry, owing to the trend of fulfilling the cosmetic demands of patients without ethical consideration and sufficient scientific background and promoting the “the more you replace, the more you earn” or “more is more” mindset in dentistry.

Changing the professional mindset of the practising clinician is not an easy task; it is just like quitting smoking for a heavy smoker. In order to practise healthy dentistry, one must be groomed, starting from dental school education, with moral values, a high ethical standard, a positive attitude and a patient-centred practice philosophy. A student reflects the mindset of his or her teachers, and a teacher or mentor with comprehensive knowledge, clinical skills, honesty and humanitiy is difficult to find in today’s business-oriented dental education. I believe that knowledge
The words “aesthetics” and “cosmetic” are viewed as synonyms by many cosmetic dentists. However, it is necessary to understand the core difference in meaning. The Oxford dictionary defines “aesthetics” as “the branch of philosophy which deals with questions of beauty and artistic taste” and “cosmetic” as “improving only the appearance of something.”

In dentistry, “aesthetics” explains the fundamental taste of a person concerning beauty, whereas “cosmetic” deals with the superficial or external enhancement of beauty. Therefore, aesthetic dentistry falls under need-based dental service, and is generally guided by the sex, race and age (SRA factors) of the patient. However, cosmetic dentistry, which is influenced by perception, personality and desires (PPD factors), can be categorised as want or demand-based dental service. For example, a patient’s request to replace old amalgam restorations with tooth-colored restorative materials can be considered an aesthetic requirement or demand. The request for an old woman for pearly white teeth and the ideal smile design is far more than an aesthetic requirement, and must be considered a cosmetic demand or requirement.

In my clinical practice, I divide aesthetic and cosmetic clinical cases into three different categories:

1. Preventive, or support based: treatment prevents or intercepts the diseases, defects, habits and other factors that may adversely affect the existing or the future smile aesthetics of the patient.
2. Nature-mimetic, or need based: treatment is carried out to restore or mimic the natural aesthetics, bearing the SRA factors of the patient in mind, and the treatment generally enhances the health and function of the oral tissue.
3. Cosmetic, or desire based: treatment is performed to enhance or supplement the aesthetic components of the smile; hence, the treatment outcome of cosmetic treatment may not be in harmony with the patient’s SRA factors as in nature-mimetic dentistry, and cosmetic treatment may not necessarily be beneficial to the health and function of the oral tissue.

Practice philosophy in dentistry: The mindset
The majority of dental schools around the world focus on teaching knowledge and skills in dental medicine that are based on contemporary dental science and art. Dental school education does not give due consideration to healthy dental practice philosophy owing to various factors, such as the rights to choose one’s practice philosophy and the domination of business rather than service-oriented dental practice in the global market. However, quality and healthy clinical practice is always a dream of a good clinician, and establishing such practice requires an unbiased vision, learning and serving attitudinal attitudes, and dedication from the dentist. We must understand that science and art in dentistry have no meaning if practiced by an unethical operator, who does not respect the overall health of the patient. Any scientific advancement in technology has positive and negative sides; hence, if not applied properly, it may adversely affect the profession and may become a threat.

I believe that a clinic or treatment centre must establish its practice philosophy according to its objectives. What a clinician wants and the kind of services he or she wants to deliver to him or her patients guides the clinic. Practically, the practice philosophy in dentistry can be classified into two different categories, depending on the mindset of the operator.

Patient-centred Clinicians with this kind of mindset generally have a do no harm dental practice (Fig. 1). Professional honesty and humanity are the fundamental principles of such a practice. Operators with this mindset enjoy sharing their clinical knowledge and skills with their professional friends and junior colleagues to promote patient-centred clinical practice in society. This group of clinicians firmly believes in the word-of-mouth approach to practice marketing and always thinks of the patient’s long-term health, function and aesthetics. Clinicians practising do no harm dentistry are generally cheerful, happy and healthy in their professional life.

Financially focused Clinicians with this kind of mindset practise a financially focused dentistry and adopt various kinds of direct marketing approaches to sell their dentistry like a commodity in the market rather than a health care service. Practitioners in this group generally achieve a secure financial position quickly, however, it is frequently seen that they develop chronic stress, burn-out syndrome, depression, frustration and professional guilt, leading to compromised health and happiness in their professional life.

Dentistry and professional stress Dentistry has long been considered a stressful occupation. Dentists perceive dentistry as being more stressful than other occupations.¹ Dentists have to deal with many significant stressors in their personal and professional lives.² There is some evidence to suggest that dentists suffer a high level of occupation-related stress.³,⁴ A study has found that 85 percent of dentists perceived dentistry as “very stressful”¹⁰ and nearly 60 percent perceived dentistry as more stressful than other professions.⁵ Stress can affect varying physiological and psychological responses in a person. Professional burn-out is one of the possible consequences of ongoing professional stress. The effect of burn-out, although work-related, often will have a negative impact on people’s personal relationships and well-being.⁶,⁷ Hence, dentists need to take care of their staff’s health and focus on professional happiness in daily practice.

A clinician has full right to adopt the practice philosophy that he or she prefers. However, it is always advisable to apply oneself to understanding, analysing and comparing this philosophy with others. I am very fortunate to have been brought up with the Vedic philosophy of the law of nature and the first, do no harm consciousness-based philosophy in my life at home, at school and in my society. The spiritual guidance and mentoring I received at an early age at home and school have helped me to become a professional with a firm philosophy of do no harm. Hence, I started practising consciousness-based dentistry early in my career. During my 21 years of private practice, I have always experienced happiness and joy with high patient satisfaction, which has given me complete confidence and faith in my practice philosophy and the MiCD treatment protocol that I apply in my practice. Since late 2009, I have been promoting my practice philosophy and clinical protocol in South Asia, and started the MiCD Global Academy in 2012 with the help of like-minded friends, who also practise a similar kind of holistic dentistry around the world. The MiCD Global Academy has a mission to share clinical knowledge and fundamental clinical skills free of charge with all clinicians who desire to practise do no harm cosmetic dentistry for better patient care and to enhance their happiness in their professional life.

Three-way test: Questions for your conscience
Cosmetic dentists can make errors in practice in two ways, first owing to a lack of the required professional knowledge and skills, and second owing to a lack of

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Table 1: Treatment options, treatment procedures and biological cost in cosmetic dentistry.

<table>
<thead>
<tr>
<th>Treatment options</th>
<th>Treatment procedures</th>
<th>Biological cost</th>
</tr>
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<tbody>
<tr>
<td>Non-invasive treatment: when hard and soft tissue is not prepared during smile enhancement procedures</td>
<td>• Smile evaluate</td>
<td>None</td>
</tr>
<tr>
<td>• Remineralization and preservation of white spots</td>
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<tr>
<td>• Oral appliances and braces panel</td>
<td></td>
<td></td>
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<tr>
<td>• Business requiring tissue preservation</td>
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<tr>
<td>Micro-macro treatment: when hard and soft tissue is prepared at a micro-level during smile enhancement procedures</td>
<td>• Cosmetic chemical treatment, such as bleaching and micro-abrasion</td>
<td>Very low</td>
</tr>
<tr>
<td></td>
<td>• Cosmetic restorations with chemicalfill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Preparation, such as direct bonding, ultra-thin veneers, adhesive pontics and overlays</td>
<td></td>
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<tr>
<td>Minimally invasive treatment: when hard and soft tissue is prepared at a superficial or minimal level during smile enhancement procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invasive treatment: when hard and soft tissue is prepared at a deeper level during smile enhancement procedures</td>
<td>• Tooth preparation for crowns, bridge abutments</td>
<td>Law</td>
</tr>
<tr>
<td></td>
<td>• Orthodontic treatment with fixed appliance systems</td>
<td></td>
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<tr>
<td></td>
<td>• Dental implants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Aesthetic surgical procedures, such as periodontal, orthognathic and facial surgeries</td>
<td></td>
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Table 2: MiCD core principles.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient’s freedom</td>
<td>Respect the patient’s freedom to choose their treatment</td>
</tr>
<tr>
<td>Patient’s confidence</td>
<td>Build patient’s confidence in the treatment</td>
</tr>
<tr>
<td>Patient’s safety</td>
<td>Ensure patient’s safety during the treatment</td>
</tr>
<tr>
<td>Patient’s satisfaction</td>
<td>Achieve patient’s satisfaction with the treatment</td>
</tr>
<tr>
<td>Patient’s economics</td>
<td>Ensure patient’s economics for the treatment</td>
</tr>
</tbody>
</table>
tional honesty and humanity. The first one can be eliminated with good education and proper training, but the second one is a mental shift in mindset, with a high level of consciousness in professional ethics, honesty and humanity when proposing a dental treatment plan to my patient. Clinicians should always keep in mind that the concept of “extension in dentistry” was pronounced by Dr G.V. Black in 1902, who formulated the concept of “extension for fused-to-metal technology in the end”.

In 2002, the FDI World Dental Federation endorsed the approach of minimal intervention dentistry, which has its roots in the conservative management of carious lesions, applying the concept of “minimum cavity preparation or decay removal”. History clearly shows that, since Dr G.V. Black era to the present day, we have been applying the concept of “extension in dentistry” in the name of prevention, retention, function, aesthetic need and conservation of remaining carious teeth. It is a clinical fact that this concept will remain the focus because the current dental treatment is different, as its treatment modalities are guided by multifactorial issues such as patient factors (mind, body, behaviour and surroundings), operator factors (knowledge, skills, honesty and humanity), protocol factors (the truth, evidence, experience and common sense), technology (feasibility, reliability, affordability and simplicity).

The use of science and technology requires considerable openness in operators and awareness in patients; hence, the operator must use his or her professional knowledge and skills with the help of the three-way test before proposing it to the audience to enhance the quality of treatment procedures and their end-result of my case has been pronounced by Dr G.V. Black, who introduced the concept of “extension in dentistry” in 1902.

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After completion of any MiCD clinical case, the patient’s overall satisfaction and the clinical success must be evaluated. In order to evaluate clinical cases comprehensively and practically, in the MiCD protocol, a clinician is advised to always summarize the MiCD clinical case in the ten areas listed in Table IV, called the MiCD summary ten.

Conclusion
In order to practise do no harm cosmetic dentistry, a clinician requires the desire, passion, dedication and will-power to become an honest professional with humanity because honesty and humanity are the pillars of do no harm cosmetic dentistry, and the mindset controls all other practice factors. The clinician must understand that honesty and humanity are not scientific like in medicine. A basic protocol must be learned, copied and applied imminently in the practical. Honesty and humanity are inner qualities of a person and are deeply related to the level of a person’s consciousness, which are generally expressed as habits and attitudes. Therefore, we need to learn these qualities at home and school, and from the profession and society.

Self-evaluation and the realisation of the difference between the practices that you obtain through your daily professional work is vital to understand and beginning to practise do no harm cosmetic dentistry in your practice.
Smile analysis and photoshop smile design technique

Prof. Edward A. McLaren & Lee Culp
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Introduction: Smile analysis and aesthetic design

Dental facial aesthetics can be defined in three ways.

Traditionally, dental and facial aesthetics have been defined in terms of macro- and micro-elements. Macro-aesthetics encompasses the interrelationship between the facial, lips, gingiva, and teeth and the perception that these relationships are pleasing. Micro-aesthetics involves the aesthetics of an individual tooth and the perception that the colour and form are pleasing.

Historically, accepted smile design concepts and smile parameters have helped to design aesthetic treatments. These specific measurements of form, colour, and tooth/aesthetic elements aid in transferring smile design information between the dentist, ceramist, and patient. Aesthetics in dentistry can encompass a broad area—known as the aesthetic zone.

Rufenacht delineated smile analysis into facial aesthetics, dental facial aesthetics, and dental aesthetics, encompassing the macro- and micro-elements described in the first definition above. Further classification identifies five levels of aesthetics: facial, orofacial, oral, dentogingival, and dental (Tab. I).

At the macro level, facial elements are evaluated for form and balance, with an emphasis on how they may be affected by dental treatment. During the macro-analysis, the balance of the facial thirds is examined (Fig. 1). If something appears unbalanced in any one of those zones, the face and/or smile will appear unesthetic.

Such evaluations help determine the extent and type of treatment necessary to affect the aesthetic changes desired. Depending on the complexity and uniqueness of a given case, orthodontics could be considered when restorative treatment alone would not produce the desired results (Fig. 2), such as when facial height is an issue and the lower third is affected. In other cases—but not all—restorative treatment could alter the vertical dimension of occlusion to enhance the bite and enhance aesthetics when a patient presents with relatively even facial thirds (Fig. 3).

Evaluating oral aesthetics

The dentolabial gingival relationship, which is considered oral aesthetics, has traditionally been the starting point for treatment planning. This process begins by determining the ideal maxillary incisal edge placement (Fig. 4). This is accom-

Facial aesthetics

Total facial form and balance

Oralofacial aesthetics

Maxillomandibular relationship to the face and oral structures

Orofacial aesthetics

Labial, dental, gingival; the relationships of the lips to the arches, gingiva, and teeth

Dentogingival aesthetics

Relationship of the gingiva to the teeth collectively and individually

Dental aesthetics

Macro- and micro-aesthetics, both intra- and infra-tooth

Table I: Components of smile analysis and aesthetic design.

Fig. 1: Three altered views of the same patient. The smile can be accomplished to enhance facial and orofacial aesthetics. —Fig. 2: Sagittal views best demonstrate which specialist should be involved in treatment, whether orthodontists or maxillofacial surgeons. To best aesthetically alter the facial aesthetics—Fig. 3: Drawing a line along the glabella, subnasale, and pogonion enables a quick evaluation of aesthetics without the need for radiographs to determine alignment of ideal inter- and intra-tooth relationships. —Fig. 4: Click “edit > stroke,” then use a two-pixel stroke line (with colour set to black) to trace your selection. Make sure the transparent layer is the active working layer.
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plished by understanding the incisal edge position relative to several different landmarks. The following questions can be used to determine the ideal incisal edge position:

- Where in the face should the maxillary incisal edges be placed?
- What is the proper tooth display, both statically and dynamically?
- What is the proper intra- and inter-tooth relationship (e.g., length and size of teeth, arch form)?
- Can the ideal position be achieved with restorative dentistry alone, or is orthodontics needed?

In order to facilitate smile evaluation based on these landmarks, the rule of 4.2.2—which refers to the amount of maxillary central display when the lips are at rest, the amount of gingival tissue revealed, and the proximity of the incisal line to the lower lip—is helpful (Fig. 1). At a time when patients perceive fuller and brighter smiles as most aesthetic, the gingival line of the four incisors is approximately the same line (Fig. 6), with the lateral incisor perhaps being slightly incisal. The gingival line should be relatively parallel to the horizon for the central incisors and the lateral incisors and symmetric on each side of the midline. The gingival contours (i.e., gingival scallop) should follow a radiating arch similar to the incisal line. The gingival scallop shapes the teeth and should be between 4 mm and 5 mm (Fig. 7). Related to normal gingival form is midline placement. Although usually the first issue addressed in smile design, it is not as significant as tooth form, gingival form, tooth shape, or smile line.

Several rules can be applied when considering modifying the midline to create an aesthetic smile design:

- The midline only should be moved to establish an aesthetic intra- and inter-tooth relationship, with the two central incisors being most important.
- The midline only should be moved restoratively up to the root of the adjacent tooth. If the midline is within 4 mm of the centre of the face, it will be aesthetically pleasing.
- The midline should be vertical when the head is in the postural rest position.

Evaluating dental aesthetics

Part of evaluating dental aesthetics for smile design is choosing tooth shapes for patients based on their facial characteristics (e.g., long and dolichocephalic, or squarish and brachycephalic). When patients present with a longer face, a more rectangular tooth within the aesthetic range is appropriate. For someone with a square face, a tooth with an 80% width-to-length ratio would be more appropriate. The width-to-length ratio most often discussed in the literature is between 75% and 80%, but aesthetic smiles could demonstrate ratios between 70% and 75% or between 80% and 85% (Figs. 8-10).

The length of teeth also affects aesthetics. Maxillary central incisor length is between 10 mm and 11 mm in length. According to Magne, the average length of an unworn maxillary central to the cementoenamel junction is slightly over 11 mm. The aesthetic zone for central incisor length, according to the authors, is between 10.5 mm and 12 mm, with 11 mm being a good starting point. Lateral incisors are between 1 mm and a maximum of 2 mm shorter than the central incisors, with the canines slightly shorter than the central incisors by between 0.5 mm and 1 mm (Fig. 11).

The inter-tooth relationship, or arch form, involves the golden proportion and position of tooth width. Although it is a good beginning, it does not reflect natural tooth proportions. Natural portions demonstrate a lateral incisor between 60% and 70% of the width of the central incisor, and this is larger than the golden proportion. However, a rule guiding proportions is that the canine and all teeth distal should be perceived to occupy less visual space (Fig. 12). Another rule to help maintain proportions throughout the arch is 1-2-3-4-5. (Fig. 13). Finally, contact areas can be moved restoratively up to the root of the adjacent tooth. Beyond that, orthodontics is required (Fig. 14).

Creating a digital smile designed in Photoshop

Although there are digital smile design services available to dentists for a fee, it is possible to use Photoshop CS5 software (Adobe Systems) to create and demonstrate for patients the proposed smile design treatments. It starts by creating tooth grids—predesigned tooth templates in different width-to-length ratios (e.g., 75% central, 80% central) that can be incorporated into a custom smile design based on patient characteristics. You can create as many different tooth grids as you like with different tooth proportions in the aesthetic zone. Once completed, you will not have to do this step again, since you will save the created tooth grids and use them to create a new desired outline form for the desired teeth.

Follow these recommended steps:

- To begin creating a tooth grid, use a Czech retracted image of an attractive smile as a basis (e.g., one with a 75% width-to-length ratio). Open the image in Photoshop and create a new clear transparent layer on top of the teeth (Fig. 15). This transparent layer will enable the image to be outlined without the work being embedded into the image.
- Name the layer appropriately and, when prompted to identify your choice of fill, choose “no fill,” since the layer will be transparent, except for the tracing of the tooth grid.
- To begin tracing the tooth grid, activate a selection tool, move to the image, and select either the polygonal lasso tool or the magnetic lasso tool. In the authors’ opinion, the polygonal works best. Once activated, zoom in (Fig. 16) and trace the teeth with the lasso tool.
The Photoshop smile design technique

The first step in the PSD technique is to create a digital conversion of the actual tooth length and width, and then digitally determine the proposed new length and proportion of the tooth.

**Determining digital tooth size**
To determine digital tooth size, follow these steps:
1. Create a conversion factor by dividing the proposed length (developed from the smile cast) with the image size (number, in this case 170 pixels) (Fig. 24). Multiply the number of pixels by the conversion factor. In this case, 170 x 1.29 = 219 pixels (Fig. 25). Select and stroke (trace) the teeth up to the second premolar (the first molar is acceptable) (Fig. 19).
2. The image should be sized now for easy future use in a smile design. If the image size is acceptable, it is best to adjust the size of the image to a height of 720 pixels (Fig. 26) by opening the image size menu and selecting 720 pixels for the height. Width will adjust proportionately.
3. At this time, the tooth grid (which can be active or not) can be aligned without the image of the teeth, by double-clicking on the layer of the tooth image. A dialog box reading “show or hide” will appear; click “OK”. This process unlocks the layer of the teeth so it can be removed. Drag the layer of the teeth to the trash, leaving only the layer with the tracing of the teeth (Fig. 21). In the file menu, click “save as” and choose “.jpg” or “.psd” (Photoshop) as the file type. This will preserve the transparency. You do not want to save it as a JPEG, since this will create a white background around the tracing. Name the file appropriately (e.g., Tooth-5 W.L. central).
4. By tracing several patients’ teeth that have tooth size and proportion in the aesthetic zone and saving them, you can create a library of tooth grids to custom design new teeth for your patients that satisfy their aesthetic needs.

**Applying a new proposed tooth form**
Next, follow these steps:
1. After performing the smile analysis and digital measurements, choose a custom tooth grid appropriate for the patient. Select a tooth grid based on the width-to-length ratio of the teeth planned with (e.g., 80/70/90 or 80/65/80). Open the image of the chosen tooth grid in Photoshop and drag the grid on to the image of the tooth to be smile designed (Fig. 27).
2. If the shape or length is deemed inappropriate, press the command button (control button for PCs) and “z” to delete and select a suitable choice from the tooth grid created (with the transparent mold/shape the tooth into the desired form). Depending on the original image size, the tooth grid may be proportionally too big or too small. To enlarge or shrink the tooth grid created (with the layer activated), press command (or control) and “t” to bring up the free transform function. While holding the shift key (holding the shift key allows you to transform the object proportionally), click and drag a corner left or right to expand or contract the custom tooth grid.
3. Adjust the size of the grid so that the outlines of the central incisors have the new proposed length. Move the grid as necessary using the move tool so that the incisal edge of the tooth grid lines up with the new proposed length (Fig. 28).
4. Areas of the grid can be individually altered using the liquify tool (Fig. 29).

**Digital creating new aesthetic teeth**
Next, follow these suggested steps:
1. With the new tooth grid layer and the magic wand tool both activated, click on each tooth to select all of the teeth in the grid (Fig. 30).
2. Expand the selection by two pixels in the expand menu; click “select” modify > expand” (Fig. 31). Note that the selection better approximates the grid. You can expand the selection or contract as necessary using the same menu.
3. Activate the layer of the teeth (cheek-retracted view) by clicking on it (Fig. 32).
4. Next, activate the liquidity filter (you will see a red mask around the shapes of the proposed teeth). The mask creates a digital limit that the teeth cannot be altered beyond. This is similar to creating a mask with tape for painting a shape (Fig. 33).

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**Adjusting tooth brightness**
The following steps are recommended next:
1. Select the whitening tool (dodge tool) to brighten the teeth. In the dodge tool palette, click on “midtones” and set the exposure to approximately 20 %. Click on the areas of the tooth you want brightened (Figs. 16 & 17).
2. Alternatively, with the teeth selected, you can use the brightness adjustment in the brightness/contrast menu; click “image > adjustments > brightness/ contrast”.

**Performing the changes on the newly designed tooth grid**
Select the whitening tool again to modify each tooth as necessary using the move tool so that the incisal edge of the tooth grid lines up with the new proposed length (Fig. 28).

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Next, follow these suggested steps:
1. With the new tooth grid layer and the magic wand tool both activated, click on each tooth to select all of the teeth in the grid (Fig. 30).
2. Expand the selection by two pixels in the expand menu; click “select” modify > expand” (Fig. 31). Note that the selection better approximates the grid. You can expand the selection or contract as necessary using the same menu.
3. Activate the layer of the teeth (cheek-retracted view) by clicking on it (Fig. 32).
4. Next, activate the liquidity filter (you will see a red mask around the shapes of the proposed teeth). The mask creates a digital limit that the teeth cannot be altered beyond. This is similar to creating a mask with tape for painting a shape (Fig. 33).
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